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NEW SERIES, No. 12

PTERIDOPHYTES OF PERU PART V

18. Asplenaceae-21. Polypodiaceae

Rolin M. Tryon

Robert G. Stolze

With the collaboration of
Blanca León

June 30, 1993
Publication 1447

FIELDIANA
BOTANY

PUBLISHED BY FIELD MUSEUM OF NATURAL HISTORY

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18. Aspleniaceae-21. Polypodiaceae

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PTERIDOPHYTA OF PERU

Part V

18. Aspleniaceae–21. Polypodiaceae

Introduction

This fifth part of the "Pteridophyta of Peru" contains the fern families Aspleniaceae, Blechnaceae, Davalliaceae, and Polypodiaceae. Although it was stated in the introduction to Part I that this pteridophyte flora would be contained in five parts, it has been deemed more practical to add a sixth part (now in progress), which will include the "water ferns," "fern allies," a brief biogeography of Peru, and a comprehensive index to the entire work. The general style, typography, form of citations, and so forth follow the previously published parts. These matters are adequately dealt with in Part I (*Fieldiana: Botany*, n.s., No. 20, 1989), and it is not necessary to repeat them here.

Campyloneurum of the Polypodiaceae has been contributed by Blanca León, and the other genera are a joint effort of Rolla M. Tryon and Robert G. Stolze, each critically reviewing the treatments prepared by the other.

Type collections from Peru are mentioned in the nomenclature but are not repeated in the specimen citations. They are, however, included in the Peru range and ecology. The nomenclature of the genera and species is not intended to be complete. It includes all names based on Peru material and other names that are considered useful to mention.

Abbreviations of periodicals generally follow the system of *Botanico-Periodicum-Huntianum* (1968), while those of books and authors generally follow the system of *Taxonomic Literature* (TL-2, 1976 *et seq.*). A notable exception is Karel Domin's "The pteridophyta of the island of Dominica" (1929), which is cited throughout as "Pterid. Dominica," in the interest of brevity. According

to TL-2, the full citation is Rozpr. Král. České Společn. Nauk, Tr. Mat. Přír. N.R. 2. The abbreviations for herbaria follow Index Herbariorum.

Acknowledgments

Blanca León is nearing completion of a monographic study of *Campyloneurum* (Polypodiaceae), a genus in which there are very few diagnostic characters to separate the species. She has seen nearly all of the type collections during several years of research and so has gained a thorough knowledge of a taxonomically difficult group of ferns. The authors are extremely fortunate to have her contribution to this flora. We would like to extend special thanks to Dr. Abundio Sagástegui (HUT) and Blanca León (USM) for their invaluable assistance in preparing loans and arranging for their packing and shipment from those two important Peruvian herbaria. The illustrations were contributed by Field Museum scientific illustrator Zorica Dabich, who created the original drawings and adapted the rest from those previously used in the *Fieldiana: Botany* publication, "The Ferns and Fern Allies of Guatemala." We are grateful to her, for her art has provided a valuable complement to the descriptions. We are indebted to Dr. Alan R. Smith and Dr. Robbin C. Moran for their critical suggestions on the treatment of *Grammitis* (Polypodiaceae), and to Dr. David B. Lellinger for stimulating discussions and correspondence pertaining to a wide variety of taxonomic problems. To Dr. Brigitte Zimmer, of the Botanical Museum, Berlin-Dahlem, we extend special thanks for valu-

able comments on typification and nomenclature, particularly in regard to *Pecluma* and *Microgramma*. We also appreciate the valuable comments presented by reviewers of the manuscript.

We are also grateful to the officers of the following institutions for granting loans of their material or allowing us to examine specimens in their herbaria: Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Berlin (B); British Museum (Natural History), London (BM); Jardin Botanique National de Belgique, Meise (BR); Field Museum of Natural History, Chicago (F); Harvard University, Cambridge, Mass.—most Gray Herbarium (GH), some Arnold Arboretum (A); Herbarium Truxillense, Universidad Nacional de Trujillo, Trujillo, Peru (HUT); Royal Botanic Gardens, Kew, England (K); Rijksherbarium, Leiden, The Netherlands (L); Missouri Botanical Garden, St. Louis (MO); New York Botanical Garden, New York (NY); Muséum National d'Histoire Naturelle, Paris (P); National Museum, Prague, Czechoslovakia (PR); Botanical Institute, Charles University, Prague, Czechoslovakia (PRC); Herbario del Instituto de Ciencias Naturales, Universidad Central, Quito, Ecuador (Q); Rijksmuseum, Stockholm, Sweden (S); University of California, Berkeley (UC); United States National Herbarium, Smithsonian Institution, Washington, D.C. (US); Herbario San Marcos, Universidad Nacional Mayor de San Marcos, Lima, Peru (USM); and Naturhistorisches Museum, Vienna (W).

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Family 18. ASPLENIACEAE

Aspleniaceae Newman, Hist. Brit. ferns, 6: 1840.
TYPE: *Asplenium* L.

Terrestrial, epiphytic, or epipetric. **Stem** commonly erect, sometimes slender and long-creeping, bearing scales (and rarely also trichomes), the scales obviously clathrate, or occasionally only incon-

spicuously so. **Leaves** circinate in vernation, pinate to decom pound, or in several species entire, essentially monomorphic, of small to moderate size, or rarely to 1 m long, petiole continuous with the stem. **Lamina** essentially glabrous, or several species with minute trichomes or reduced scales, especially along the rachis, the rachis sometimes proliferous at the pinna axils or apex. **Veins** free, or in a few species casually to freely anastomosing. **Sori** linear to elliptic, borne along a vein, covered by a short to very long and narrow indusium, or rarely with a nearly marginal pouch formed by the indusium and opposed leaf tissue, paraphyses lacking. **Sporangia** usually long-stalked, the cells of the stalk uniseriate below its apex, the annulus interrupted by the stalk. **Spores** monoletе, bilateral, lacking chlorophyll, usually with sharp folds in the perispore.

The Aspleniaceae, as recognized here, are a family of about 700 species, included in seven genera, of which five are found in the New World: *Asplenium*, *Camptosorus*, *Holodictyum*, *Pleurosorus*, and *Schaffneria*. Only *Asplenium* occurs in Peru. The family is typically characterized by small to medium-sized leaves with clathrate stem scales and nonarticulate petioles, veins commonly free or, when anastomosing, the areoles without free included veinlets, and elongate sori with a narrow indusium borne along a vein.

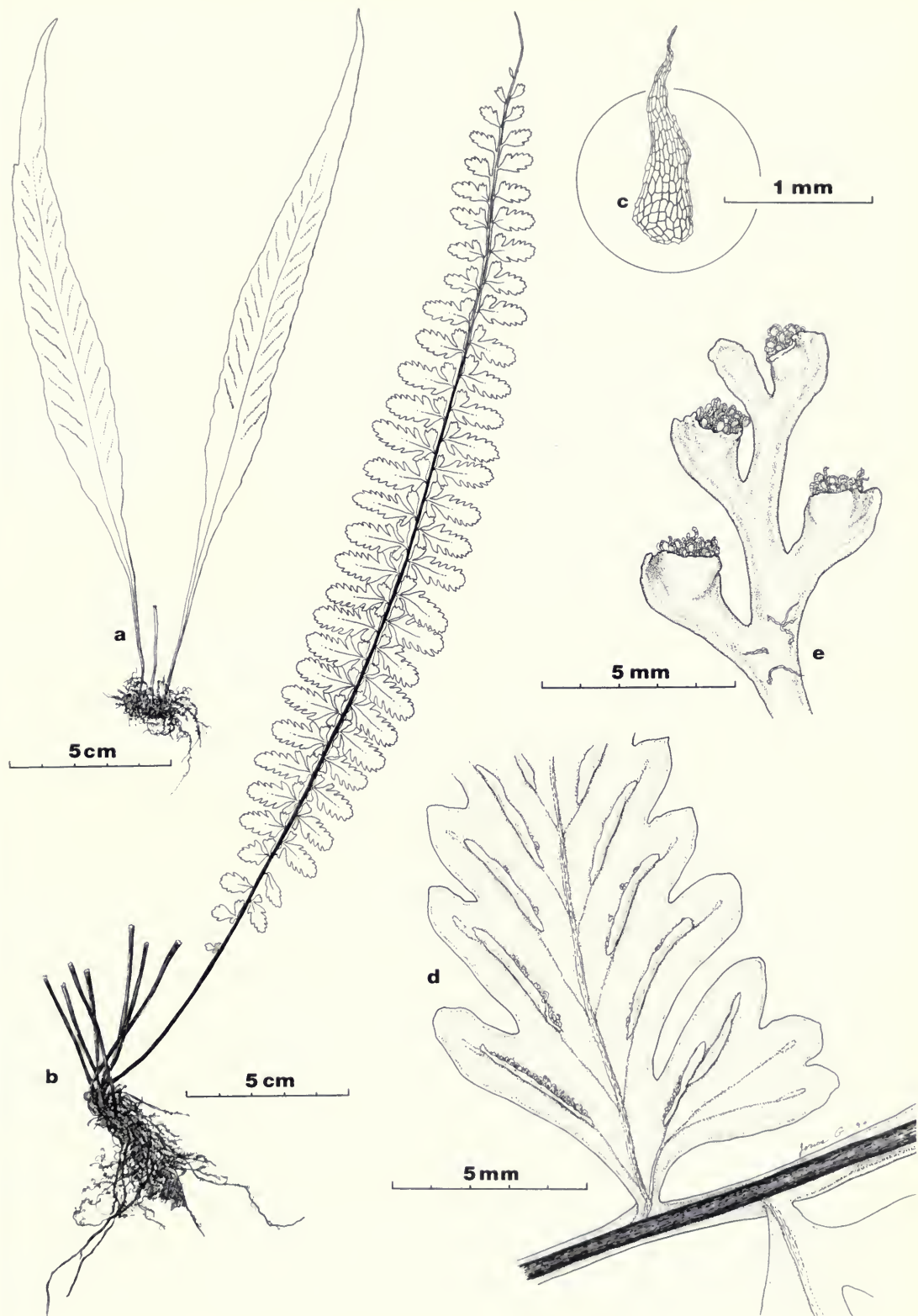
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STOLZE, R. G. 1986. Polypodiaceae—Asplenoideae. In Harling, G., and B. Sparre, eds., Flora of Ecuador 23: 1–83. Stockholm.
TRYON, R. M., AND A. F. TRYON. 1982. Aspleniaceae, pp. 627–654. In Ferns and Allied Plants. Springer-Verlag, New York.

I. *Asplenium*

***Asplenium* L.**, Sp. pl. 1079. 1753; Gen. pl., ed. 5, 485. 1754. TYPE: *Asplenium marinum* L.
Figure 1.

FIG. 1. *Asplenium pseudoangustum*: a, habit. *Asplenium hallii*: b, habit; c, stem scale; d, base of pinna. *Asplenium theciferum*: e, apex of pinna. (a from Schunke V. 6951, F; b, c, d from Acosta Solis 13761, Ecuador, F; e from Holm-Nielsen et al. 4110, Ecuador, F.)



Phyllitis Hill, Brit. herb. 525. 1757. TYPE: *Phyllitis scolopendrium* Newman = *Asplenium scolopendrium* L.
Loxoscaphe Moore, Hooker's J. Bot. Kew Gard. Misc. 5: 227. 1853. TYPE: *Loxoscaphe concinna* (Schrader) Moore (*Davallia concinna* Schrader) = *Asplenium concinnum* (Schrader) Kuhn = *Asplenium theciferum* (HBK.) Mett.

Leaves pinnate to 4-pinnate, in a few species entire, 3–60(–100) cm long. **Lamina** terminating in a conform apical segment, or more commonly tapering to a pinnatifid apex, or occasionally with a flagellate, proliferous tip. **Pinnae**, when present, several to many, subequilateral to (more commonly) inequilateral at base. **Veins** simple or forked, free, or reticulate in *A. purdieanum*. **Sori** elliptic to (more commonly) linear, borne along the acroscopic side of veins or, in several species, a few of them also borne along the basiscopic side (thus back-to-back, i.e., diplazoid). **Indusia** narrow, attached along the vein and opening toward the midrib, commonly persistent, rarely obsolete, or in *A. theciferum* cuplike or pouchlike, borne singly near segment tips, with sporangia deeply immersed. **Sporangia** on slender stalks composed of a single row of cells, annular cells commonly 20–25.

There are more than 600 species in this nearly cosmopolitan genus, a majority of these occurring in wet forests of tropical regions. Unfortunately, although the numerous species are rather easily identified to genus, they are not readily (or at least

obviously) classified into infrageneric groups. As in *Diplazium*, many can be separated on the basis of pinna dissection, and yet very closely related species (and even a species itself) can be 1–3-pinnate. One exception to this is the group of species often placed in the genus *Loxoscaphe*. Most, including *Asplenium theciferum*, are quite distinctive in their indusia, which are generally pouch- or cup-shaped and occur near the segment margin. By means of this character, the latter species cannot be confused with any other in Peru. But there are a few Old World species in the group in which the sori intergrade to a more typical *Asplenium* sorus. For this reason *Loxoscaphe* is included with *Asplenium* for purposes of this treatment.

A few species with back-to-back (diplazoid) sori are frequently determined as *Diplazium*. With these species, comparison of stem scales, and of sporangia stalks and annular cells, is necessary for positive identification to genus. (Also see Smith, 1976.)

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 SMITH, A. R. 1976. *Diplazium delitescens* and the Neotropical species of *Asplenium* sect. *Hymenasplenium*. Amer. Fern J., 66: 116–120.

Key to Species of *Asplenium*

- a. Lamina simple, margins entire or serrate; petiole obsolete or $\frac{1}{10}$ to $\frac{1}{20}$ the length of the lamina . . b
 - b. Larger adult leaves 4.2–15 cm broad, 20–70(–100) cm long; veins usually spreading at 50–75° from the midrib 1. **A. serratum**
 - b. Larger mature leaves 0.5–3(–4) cm broad, 8–30(–40) cm long; veins spreading at 30–45° from the midrib c
 - c. Midrib with scattered, minute, clathrate scales, at least abaxially; stem scales blackish, linear, attenuate, obscurely clathrate; veins commonly evident (if not prominent) . . . 2. **A. angustum**
 - c. Midrib lacking scales; stem scales brown, lanceolate to ovate, acute or acuminate; veins obscure 3. **A. pseudoangustum**
- a. Lamina lobed or pinnate to decompose or (in a few species) simple and unlobed, and then petiole $\frac{1}{4}$ – $\frac{1}{2}$ the length of the lamina d
 - d. Indusium cup- or pocket-shaped, borne along the acroscopic side of ultimate segments near their tips 62. **A. theciferum**
 - d. Indusium linear to narrow-elliptic, attached along the vein and opening toward the midrib . . e
 - e. Lamina simple, the margins entire to serrate or crenulate f
 - f. Lamina base extremely long-decurrent; midrib abaxially with scattered, minute, blackish scales; lamina chartaceous, lacking glandular trichomes 4. **A. stuebelianum**
 - f. Lamina base short-decurrent; midrib lacking scales; lamina thin- to firm-herbaceous, with scattered, minute (0.1–0.2 mm), appressed, often gland-tipped trichomes . . 5. **A. pearcei**

- e. Lamina lobed to 1-pinnate or decompose g
- g. Lamina shallowly lobed to pinnatifid (or some juvenile leaves with a pair of lobed basal pinnae); leaves diminutive, 2–6 cm long, 0.2–0.8 mm broad 6. **A. escaleroense**
- g. Lamina regularly 1-pinnate or decompose (in a few species juvenile leaves sometimes simple and entire); leaves small to large h
- h. Basal pair of pinnae much more strongly produced basiscopically than acroscopically; lamina with few to many whitish, septate trichomes, especially on rachis, veins, and margins 7. **A. pumilum**
- h. Basal pair of pinnae subequilateral at base or more strongly produced acroscopically; lamina lacking whitish, septate trichomes i
- i. Petiole and base of rachis highly lustrous and dark brown, atropurpureous or blackish j
- j. Pinnae entire to sharply and deeply incised, 0.6–1.5 cm long k
- k. Pinnae deeply incised 8. **A. formosum**
- k. Pinnae entire to crenate, serrate, or shallowly lobed l
- l. Adaxial raised ribs of rachis conspicuously hirsute, the rigid, spreading, castaneous trichomes to 0.3 mm long; pinnae subequilateral ... 9. **A. extensum**
- l. Adaxial ribs or wings of rachis entire, denticulate, or pustulate; pinnae inequilateral at base, cuneate basiscopically, truncate and often subauriculate acroscopically m
- m. Vein tips not dilated, inconspicuous, or obscured in leaf tissue; adaxial ribs of rachis each with a pronounced, foliaceous green wing throughout 10. **A. resiliens**
- m. Vein tips (most of them) somewhat to strongly dilated and conspicuous on adaxial side of pinnae; adaxial ribs commonly lacking foliaceous green wings 11. **A. monanthes**
- j. Pinnae 1–3-pinnate, or if subentire to incised, then larger ones (1.8–)2–12 cm long n
- n. Lamina gradually reduced at base; petiole 1–6 cm long o
- o. Lamina 2–3-pinnate 12. **A. rutaceum**
- o. Lamina 1-pinnate-pinnatisect 13. **A. hallii**
- n. Lamina truncate or nearly so p
- p. Rachis not prolonged or proliferous, the lamina apex pinnatifid; stem short-creeping (often inconspicuously so in *A. laetum*); pinnae subentire to shallowly pinnatifid q
- q. Pinnae 15–24 pairs, 2.5–4.5 cm long, most of them strongly inequilateral for nearly half their length 31. **A. laetum**
- q. Pinnae 7–11 pairs, larger ones 6–12 cm long, essentially equilateral except at the base 32. **A. melanopus**
- p. Rachis prolonged, often proliferous; stem erect or decumbent; pinnae subentire to 3-pinnate r
- r. Stem scales 0.6–1 mm broad, ovate or broadly lanceolate, acute, dark or grayish brown and often with lighter brown margins ... 14. **A. macrurum**
- r. Stem scales 0.1–0.3 mm broad, linear or narrowly lanceolate, attenuate, gray-brown to blackish, concolorous 15. **A. radicans**
- i. Petiole and base of rachis not or slightly lustrous, green, reddish or grayish brown (rarely darker, but then not highly lustrous) s
- s. Pinnae mostly trifoliate or bifoliate, occasionally with 1(–2) additional pairs of pinnules t
- t. Leaves 1.5–5 cm long, remote, borne singly or in pairs from long-creeping, stoloniform roots; pinnae 4–8 pairs; stem scales few, 0.5 mm long 16. **A. repens**
- t. Leaves (4–)6–30 cm long, fasciculate from an erect stem, pinnae numerous; stem scales many, 1–2 mm long 17. **A. triphyllum**

- s. Pinnae simple or regularly pinnate to decompose, not trifoliate or bifoliate u
- u. Lamina 2-pinnate or more, at least at pinna bases; basal segments (pinnules) of proximal pinnae obviously stalked v
- v. Lamina conspicuously reduced at base, proximal pinnae often rudimentary w
- w. Fertile ultimate segments mostly less than 2 mm long, conspicuously broader than adjacent sterile ones; stem scales bicolorous, blackish with narrow but conspicuously brown margins 18. *A. divaricatum*
- w. Fertile and sterile ultimate segments 2–4 mm long, subequal; stem scales concolorous, or occasionally faintly brown-margined x
- x. Lamina linear, 2-pinnate; pinnules 3–6 pairs on a pinna; plants epipetric (rarely terrestrial), growing above 2900 m 19. *A. haenkeanum*
- x. Lamina elliptic or elliptic-ovate, 2-pinnate-pinnatisect or 3-pinnate; pinnules of larger pinnae 7–14 pairs; plants terrestrial (rarely epipetric or epiphytic), at elevations from 250 to 2700 m y
- y. Pinnae commonly patent, margins parallel for much of their length; ultimate segments mostly narrow-elliptic, acute 20. *A. cristatum*
- y. Pinnae commonly ascending, broadest near the base, from there gradually to abruptly tapering to apex; ultimate segments mostly obovate, obtuse to subacute 21. *A. myriophyllum*
- v. Lamina not or scarcely reduced at base z
- z. Leaves 1.5–8(–10) cm long, borne directly on stoloniform (commonly long-creeping) roots; scales of petiole base 0.4–0.6 mm long a2
- a2. Ultimate segments flabelliform, subdigitately incised at apex, veins commonly 1-forked in each segment; petiole to 0.5 cm long 16. *A. repens*
- a2. Ultimate segments linear or narrowly oblanceolate, apex acute, veins simple in each segment; petiole 1.5–4 cm long .. 22. *A. delicatulum*
- z. Leaves (10–)12–100 cm long, borne on a stout, short-creeping to erect, stem; scales of stem and petiole base 1.5–20 mm long b2
- b2. Rachis obviously alate throughout; most pinnae oblong, margins parallel for much of their length, spreading at right angles, sessile, their basal pinnules strongly overlapping the rachis ... 20. *A. cristatum*
- b2. Rachis nonalate, or narrowly so distally; pinnae ovate or deltate, tapering from base to apex, ascending, short-stalked, basal pinnules not or infrequently overlapping the rachis c2
- c2. Lamina 15–20 cm broad; pinnules (2–)3–9 cm long; stem scales 10–20 mm long, 3–6 mm broad; indusia thin, commonly scarious 23. *A. squamosum*
- c2. Lamina 2–12(–15) cm broad; pinnules 0.5–2 cm long; stem scales 2–4 mm long, 0.3–0.8 mm broad; indusia firm or thick and fleshy, whitish to gray, or light brown d2
- d2. Stem scales linear, attenuate, dark brown; lustrous; ultimate segments obovate to subflabellate, broadly and obtusely dentate near apex; veins subdichotomously branched 56. *A. cuneatum*
- d2. Stem scales lanceolate to ovate, dull orange to gray-brown; ultimate segments linear-lanceolate or elliptic, acute or subacute; veins 1-forked to pinnately branched 24. *A. cuspidatum*
- u. Lamina 1-pinnate to 1-pinnate-pinnatisect (in a few species nearly 2-pinnate at bases of proximal pinnae); basal secondary segments (if any) adnate, not freely stalked e2

- e2. Lamina terminating in a distinct, conform or subconform apical segment (this occasionally with a basal lobe or auricle) f2
- f2. Veins anastomosing, especially toward pinna margin; petiole copiously scaly 61. **A. purdieanum**
- f2. Veins free; petiole naked or sparsely scaly (or sometimes in *A. serra* conspicuously scaly) g2
- g2. Leaves approximate to remote on a short- to long-creeping stem h2
- h2. Stem abundantly scaly; lamina firm-herbaceous to (more commonly) chartaceous, the petiole and rachis scaly (scales at times caducous); pinnae subequilateral at base 57. **A. serra**
- h2. Stem essentially lacking scales; lamina membranaceous or thin-herbaceous, the petiole and rachis naked; pinnae conspicuously inequilateral at base 25. **A. repandulum**
- g2. Leaves crowded to caespitose on an erect to decumbent (rarely very short-creeping) stem i2
- i2. Pinnae conspicuously inequilateral at base, there acroscopically truncate to cordate or auriculate, often overlapping the rachis j2
- j2. Larger pinnae 2.5–4 cm broad; pinnae bases (at least proximal ones) mostly truncate to broadly rounded basiscopically 26. **A. vomeriforme**
- j2. Larger pinnae 1–2 cm broad; pinna bases mostly narrowly cuneate basiscopically 53. **A. salicifolium**
- i2. Pinnae subequilateral at base, there broadly or narrowly cuneate to attenuate k2
- k2. Stem scales filiform, 0.1–0.3(–0.4) mm broad 27. **A. juglandifolium**
- k2. Stem scales lanceolate to ovate, 0.5–2 mm broad 12
- 12. Lamina with 1 (very rarely 2) pair of pinnae, these subopposite and narrowly adnate; stem scales 3–4 mm long 5. **A. pearcei**
- 12. Lamina with (1)–2–8 pairs of pinnae, these alternate, sessile or short-stalked, not or rarely adnate; stem scales mostly 5–15 mm long m2
- m2. Stem scales 1–2.5 mm long, 0.5 mm broad, blackish, often slightly vaulted; apical lamina segment 1–1.7 mm broad or occasionally obsolete 28. **A. tuerckheimii**
- m2. Stem scales 5–15 mm long, mostly 1–2 mm broad, orange to brown, flat; apical segment 2.2–5.0 cm broad n2
- n2. Pinna margins entire; lamina glabrous abaxially; plants epiphytic 29. **A. tricholepis**
- n2. Pinna margins crenate-serrate; lamina moderately to amply provided abaxially with minute, appressed, dark brown trichomes; plants terrestrial 30. **A. davisii**
- e2. Lamina tapering to a pinnatifid, caudate, or flagelliform apex or, if with a distinct terminal segment, this obviously differing in shape from lateral segments o2
- o2. Petiole, rachis and tissue sparsely to copiously scaly, the scales dark and filiform, with prolonged, unicastate apices p2

- p2. Pinnae serrate to deeply and irregularly erose-lacerate, not cuneately lobed 58. **A. dimidiatum**
- p2. Pinnae deeply lobed, the 3–6 segments cuneiform, their apices often lacerate 59. **A. praemorsum**
- o2. Petiole, rachis and tissue with scales lacking or scattered and inconspicuous q2
- q2. Stem short-creeping (sometimes not obviously so in *A. laetum*); leaves closely spaced or crowded along the stem r2
- r2. Pinnae 14–24 pairs, larger ones 2.5–5 cm long; sori not or rarely diplazioid s2
- s2. Stem scales orange; veins and sori subparallel, or diverging at 5–10°; pinnae deeply pinnatisect 60. **A. lividum**
- s2. Stem scales dark brown or blackish; veins and sori diverging at 30–40°; pinnae bicrenate or biserrate 31. **A. laetum**
- r2. Pinnae 6–10(–12) pairs, larger ones 6–14 cm long; sori often diplazioid t2
- t2. Pinnae (at least proximal ones) lobed to pinnatifid on both margins, the tip of each lobe with a few rounded teeth 32. **A. melanopus**
- t2. Pinnae serrate to deeply crenate acroscopically, serrate to subentire basiscopically 33. **A. delitescens**
- q2. Stem erect, not creeping; leaves fasciculate to densely caespitose u2
- u2. Pinnae incised nearly to the costa into 7–16 pairs of entire to crenate segments 34. **A. achilleifolium**
- u2. Pinnae subentire to crenate, or with a nearly free basal acroscopic auricle, but not regularly pinnatisect v2
- v2. Pinnae lacking a definite midrib, the veins few and commonly subflabellately dichotomous w2
- w2. Veins conspicuous, blackish, simple or 2–3-forked; pinnae 2–3 mm long, with short, blackish, stalks 35. **A. projectum**
- w2. Veins obscure, or if distinct only slightly darker than the laminar tissue, commonly subflabellate, 2–3 times dichotomous; pinnae 4–14 mm long, not black-stalked x2
- x2. Larger pinnae 10–14 mm long; plants terrestrial, growing below 1000 m 36. **A. lorentzii**
- x2. Larger pinnae 4–8(–10) mm long; plants epipetric (rarely terrestrial), growing above 2700 m y2
- y2. Petiole 0.2–0.4 mm thick, this and rachis flexuous and greenish or stramineous; pinnae broadly and deeply lobed and cuspidate 37. **A. gilliesii**
- y2. Petiole 0.5–1 mm thick, this and rachis rigid and commonly reddish or grayish brown; pinna margins entire to deeply dentate, rarely lobed 38. **A. peruvianum**
- v2. Pinnae, at least in the proximal half, with a definite, central (or basiscopical in subdimidiate pinnae) axis, this either a thick, raised, costa, or straight midvein bearing several to many pinnately arranged veins z2

- z2. Stem scales lacking; pinna midrib with 2(–3) acroscopic, and usually 1 basiscopic, veins 39. **A. quitense**
- z2. Stem scales ample and conspicuous; pinnae, larger ones, with 3–many pairs of veins (sometimes less in *A. pulchellum*) a3
- a3. Pinnae subdimidiate, i.e., conspicuously inequilateral for half their length or more; veins 1–3 (–4) on basiscopic side of the pinna, and the basiscopic margin entire b3
- b3. Lamina apex acuminate to subcaudate; pinna apex acute; acroscopic margin deeply and acutely cleft 40. **A. pulchellum**
- b3. Lamina apex acute; pinna apex obtuse; acroscopic margin crenate-serrate 41. **A. discrepans**
- a3. Pinnae subequilateral, or inequilateral only toward the base; veins 5–many on basiscopic side (sometimes less in *A. tabinense* but then the basiscopic margin narrowly and deeply crenate) c3
- c3. Veins all simple, or proximal 1–3 veins forked on acroscopic side of pinnae d3
- d3. Lamina gradually reduced to rudimentary basal pinnae; petiole very short, $\frac{1}{5}$ – $\frac{1}{10}$ the length of the lamina e3
- e3. Rachis broadly alate, each wing often as wide as the rachis; acroscopic pinna margin serrulate to deeply serrate; elevation 400–1100 m ... 42. **A. pteropus**
- e3. Rachis narrow-alate; acroscopic pinna margin deeply and narrowly crenate to shallowly lobed, and often with a discrete basal auricle; elevation 1500–3600 m f3
- f3. Basal acroscopic pinna auricle cut nearly to costa; sori commonly 8–12 on larger pinnae 43. **A. sessilifolium**
- f3. Basal acroscopic pinna auricle cut (if at all) only halfway to costa; sori commonly 4–7 on larger pinnae 44. **A. tabinense**
- d3. Lamina scarcely reduced at base, or several pinnae reduced and the basal ones half the size of largest ones; petiole $\frac{1}{4}$ – $\frac{1}{2}$ the length of the lamina g3
- g3. Lamina apex with a subcaudate, proliferous tip ... 45. **A. herzogii**
- g3. Lamina apex pinnatifid, not proliferous h3
- h3. Pinna margins subentire to crenulate; pinnae 1.2–2.2(–2.5) cm long; stem scales 1.5–3 mm

- long, blackish, attenuate
 46. **A. bangii**
- h3. Pinna margins deeply serrate to
 serrately lobed; pinnae (larger
 ones) mostly 2.5–9 cm long;
 stem scales 4–10 mm long, gray
 brown or, if dark brown to
 blackish (in *A. harpeodes*) then
 with a long, tortuous, unicos-
 tate tip i3
- i3. Stem scales deep brown to
 blackish, linear, with long,
 tortuous, unicastate tips;
 pinnae (24–)30–50 pairs;
 rachis atropurpureous . . .
 47. **A. harpeodes**
- i3. Stem scales gray-brown,
 linear- to ovate-lanceolate,
 acute to attenuate; pinnae
 (12–)15–24 pairs; rachis
 gray- to red-brown
 48. **A. raddianum**
- c3. Veins all forked on acroscopic side of pinnae,
 except 1–3 apical ones simple j3
- j3. Lamina abruptly ending in a proliferous
 tip; rachis (and usually petiole) broadly
 alate, the wing 1–2 mm broad
 49. **A. alatum**
- j3. Lamina tip not proliferous; rachis and
 petiole narrowly or vestigially alate, or
 occasionally the rachis wing to 1 mm
 broad k3
- k3. Indusia thin and mostly scarious,
 often hyaline until mature l3
- l3. Lamina chartaceous, abruptly
 terminating in a broad-based,
 nonconform, apical segment;
 petiole 12–25 cm long; pinnae
 4–12 pairs 50. **A. abscissum**
- l3. Lamina firm-herbaceous to
 membranaceous, gradually re-
 duced to a pinnatifid, usually
 acuminate, apex; petiole 4–9 cm
 long; pinnae 15–40 pairs
 51. **A. drepanophyllum**
- k3. Indusia (at least mature ones) firm
 and fleshy, opaque m3
- m3. Lamina very gradually taper-
 ing to a pinnatifid, often sub-
 caudate apex; stem scales ecil-
 iate 52. **A. auritum**
- m3. Lamina abruptly reduced at
 apex, the apical section ser-
 rate-ligulate, broad-based and
 nonconform, or indefinite;

stem scales with orange cilia n3
 n3. Veins mostly 2-forked; lamina ending in a broad-based, nonconform, sometimes hastate, terminal segment
 53. *A. salicifolium*
 n3. Veins simple to 1-forked; lamina ending in a narrow, serrate-ligulate, or subcaudate apex o3
 o3. Stem scales 6–9 mm long; pinna apex commonly attenuate ... 54. *A. hastatum*
 o3. Stem scales 2–4(–5) mm long; pinna apex acute or subacute ..
 55. *A. auriculatum*

1. *Asplenium serratum* L., Sp. pl. 1079. 1753.
LECTOTYPE (designated by Proctor, in Howard, Flora Lesser Antilles 2: 313. 1977): Plumier, Descr. pl. Amér. t. 39. 1693.

Plants epiphytic, occasionally terrestrial. **Stem** stout, provided with brown-tomentose roots and usually iridescent, gray-brown (rarely blackish) scales, these obviously clathrate, linear or linear-lanceolate, attenuate, (5–)7–18 mm long. **Leaves** densely caespitose, sessile or subsessile, simple and unlobed, larger mature ones 20–70(–100) cm long 4.2–15 cm broad. **Petiole** 0–4 cm long, $\frac{1}{10}$ – $\frac{1}{20}$ the length of the lamina. **Lamina** chartaceous, acute to acuminate or abruptly caudate at the apex, gradually reduced to a long-attenuate base, with entire to crenulate or bluntly serrate margins, glabrous and eglandular, but midrib with minute, scattered, blackish, clathrate scales, at least abaxially. **Veins** simple to 1-forked, spreading at 50–75° from the midrib. **Sori** densely crowded, greatly elongated. **Indusia** elongated, thin, often scarious.

In deep, wet forests, on tree trunks and branches, occasionally in alluvial soil on ravine or stream banks, 100–800(–1200) m, Amazonas and Loreto to Cuzco and Madre de Dios.

United States (southern Florida); West Indies; southern Mexico to Argentina and Paraguay.

This and similar species such as the Old World *A. nidus* L., have been given the common name “Bird’s Nest Ferns,” due to their growth habit.

The large, densely caespitose leaves of older plants often form a tight circle, the center of which then becomes a receptacle for a mixture of organic matter that falls, or is blown in, from above. With this perhaps should be included *A. angustum* and *A. stuebelianum*, which are probably only variants. The two taxa differ from *A. serratum* merely by subtle characters of leaf shape, vein angle, and stem scales, and a number of specimens examined during this study are clearly intermediates. Stem scales of *A. serratum* are typically 8–15 mm long, gray-brown, and conspicuously clathrate, but occasionally they are smaller, darker, and more narrowly clathrate like those of *A. stuebelianum*.

Some specimens of *A. pearcei* have simple leaves and are often determined as *A. serratum*. However, the former have long petioles like those of *A. stuebelianum* as well as several other differing characters, which are discussed under that species.

Amazonas: Prov. Bagua, NE of Chiriaco, *Barbour* 4513 (F, MO, USM). **San Martín:** Chazuta, Río Huallaga, *Klug* 4140 (F, GH). **Loreto:** Gamitanacocha, Río Mazán, *J. Schunke* 276 (F, GH, UC). **Huánuco:** Prov. Huánuco, near confluence of Río Cayumba with Huallaga, *Mexia* 8276 (F, GH, MO, UC, US). **Pasco:** Prov. Oxapampa, Palcazú valley, Iscozacín, *Foster* 7973 (F, MO). **Junín:** Chanchamayo, La Merced, *Soukup* 1011 (F). **Ucayali** (as Loreto): Prov. Coronel Portillo, between Divisoria and Boquerón, *Ferreya* 4273 (GH, USM). **Cuzco:** Prov. La Convención, Río Apurímac, below Puerto Capiro, *Davis et al.* 1300 (F, GH). **Madre de Dios:** Prov. Manú, Manú National Park, Cocha Cashu Station, *Foster et al.* 6629 (F), 6916 (F).

2. *Asplenium angustum* Sw., Kongl. Vetensk. Acad. Handl. 38: 66, t. 4, f. 1. 1817. TYPE: "Habitat in Brasilia," Freyreis (holotype, s; photos, F, US).

Plants epiphytic. **Stem** erect, provided with brown-tomentose roots and blackish scales, these linear, 4–5(–6) mm long including the attenuate, unicostate tip, obscurely clathrate. **Leaves** caespitose, sessile or subsessile, simple, 8–30(–40) cm long, 0.5–3(–4) cm broad. **Petiole** 0–2 cm long, $\frac{1}{10}$ – $\frac{1}{20}$ the length of the lamina. **Lamina** firm-herbaceous to chartaceous, long-attenuate to apex and base, lacking proliferous buds, margins entire, glabrous and eglandular, but midrib provided with scattered, minute, dark, clathrate scales, at least abaxially. **Veins** simple to 1-forked, spreading at 30–45° from the midrib. **Sori** approximate to subdistant, linear to elliptic. **Indusia** linear to elliptic, whitish to pale greenish, relatively thick, not translucent.

In wet forests, on tree trunks, 100–1100 m, Loreto, Pasco, Madre de Dios.

The Guianas to Colombia; Peru; Brazil.

This is but provisionally maintained as distinct from *A. serratum*. Whereas the extreme forms of each appear to be discrete, a number of specimens toward the edge of the range tend to be intermediate. Typical *A. angustum*, especially in Brazil, has leaves less than 2.5 cm broad and very gradually tapering to apex and base, the veins borne at an angle of less than 45° from the midrib, the indusia relatively broad and thick-textured, and whitish and obscure, not crowded, and the stem scales blackish and obscurely clathrate. This contrasts greatly with typical *A. serratum*, with lamina 8–12 cm broad and abruptly acute or acuminate at apex, the veins at angles of 50–60°, the indusia very long and narrow, scarious and densely crowded, and the stem scales brownish, iridescent, and obviously clathrate. However, a number of smaller specimens of *A. serratum* exhibit nearly the size and vein angle of *A. angustum* and have blackish and less conspicuously clathrate stem scales. Several of the specimens from Peru cited below are approximately intermediate but have features much closer to *A. angustum* than to *A. serratum* and therefore are so identified here. Monographic study may prove the former to be merely a variant of the latter.

Loreto: Prov. Maynas, Dist. Iquitos, Río Momón, below Balcón, Hickock 606 (GH). Lower Río Momoncillo,

lower Río Momón, near Iquitos, Jones & Davidson 9515 (MO, US). Prov. Maynas, Mishana, van der Werff et al. 10181 (MO, UC). **Pasco** (as Junín): Pichis Trail, San Nicolás, Killip & Smith 30698 (US). **Madre de Dios:** Tambopata Nature Reserve, SE bank of Río Tambopata, Barbour 5185 (MO). Parque Nacional del Manú, Cocha Cashu Biological Station, M. Foster P-84-52 (UC).

3. *Asplenium pseudoangustum* Stolze, Amer. Fern J. 74: 49. 1984. TYPE: Peru, Huánuco, Tingo María, Tryon & Tryon 5257 (holotype, GH; isotypes, F!, US!, USM!). **Figure 1a.**

Plants epiphytic. **Stem** small, erect to decumbent, provided with dark or light brown, clathrate scales, these lanceolate or ovate, acute to acuminate, 1.5–3 mm long. **Leaves** caespitose, sessile or subsessile, simple, 8–22 cm long, 1.3–2.5(–3) cm broad. **Petiole** essentially lacking. **Lamina** firm-herbaceous, subcarnose, elliptic, apex acute (sometimes somewhat attenuate), long-attenuate at base, lacking proliferous buds, margins entire, surfaces and midrib glabrous and lacking scales. **Veins** 1(–2)-forked, obscure, spreading at 30–45° from the midrib. **Sori** well spaced, linear. **Indusia** linear, pale green or yellow-green, not translucent, becoming dark brown and thicker at maturity.

On tree trunks in wet forests, 350–1400 m, San Martín to Cuzco and Madre de Dios.

Ecuador; Peru.

Although resembling *A. angustum* in size and shape, this is quite a distinct species, as evidenced by the key characters. In addition, *A. pseudoangustum* has somewhat succulent leaves that often commonly dry blackish green. Leaves of *A. angustum* dry gray- or yellow-green.

San Martín: Prov. Mariscal Cáceres, between Aucayacu and Uchiza, Ferreyra 17038 (GH, USM). Prov. Mariscal Cáceres, Tocache Nuevo, J. Schunke V. 5671 (F, US). **Huánuco** (as San Martín): Tingo María, Allard 21596a (US), 22384 (US). **Pasco:** Paujil, near Puerto Bermúdez, León et al. 292 (GH, USM). Prov. Oxapampa, Valle de Palcazú, near Iscozacín, León 715 (F, GH). **Cuzco:** Prov. La Convención, Tupitani, Bües 5450 (US). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, Foster et al. 10827 (F).

4. *Asplenium stuebelianum* Hieron., Hedwigia 47: 222. 1908. TYPE: Colombia, Prov. Cundinamarca, near Villavicencio and Oca, Stübel 659 (holotype, presumably B).

Plants epiphytic, occasionally terrestrial. **Stem** stout, erect or decumbent, provided with brown-tomentose roots and gray-brown to blackish scales,

these obscurely to narrowly clathrate, linear or linear-lanceolate, attenuate, 2–4(–6) mm long. **Leaves** densely caespitose, usually conspicuously petiolate, simple and unlobed, larger mature ones 25–50 cm long, 3.5–9 cm broad, proliferous buds occasionally borne at the apex. **Petiole** (3–)5–18 cm long, usually $\frac{1}{4}$ – $\frac{1}{2}$ the length of the lamina. **Lamina** chartaceous, acute to acuminate or abruptly caudate at the apex, at the base abruptly reduced and then long-attenuate, margins entire to crenulate or bluntly serrate, glabrous and eglandular, but midrib with minute, scattered, blackish, clathrate scales, at least abaxially. **Veins** simple to 1-forked, spreading at 60–75° from the midrib. **Sori** densely crowded, greatly elongated. **Indusia** elongated, thin, often scarious.

In deep, wet forests, on tree trunks and branches, occasionally in alluvial soil or ravine or stream banks, 100–1400 m, Amazonas and Loreto south to Junín, Madre de Dios.

Venezuela; Colombia; Peru; Bolivia; Brazil.

Asplenium stuebelianum is perhaps merely a variety of *A. serratum*, from which it differs principally in the petiolate or subpetiolate lamina. In the latter the lamina tapers very gradually and regularly to the stem, with petioles (if any) only a few centimeters long. The lamina in *A. stuebelianum* is reduced suddenly and markedly and then is attenuate to a narrowly winged or naked petiole, which is typically 6–12 cm long. For further comparison see treatment of *A. serratum*. The Wurdack collection, cited below from Amazonas, is intermediate between the two taxa, in characters of both lamina and stem scales.

Amazonas: Prov. Bagua, Río Marañón above Cascadas de Mayasi, *Wurdack* 1971 (F, GH, UC, US). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Puerto Pizana, *Schunke* V. 6947 (F). **Loreto:** Mishiyacu, near Iquitos, *Klug* 1537 (F, US). **Huánuco:** Prov. Pachitea, Dist. Puerto Inca, Bosque Nacional de Iparia, *Schunke* V. 2968 (F, GH, US). **Junín:** Puente Perene, *Coronado* 254 (GH). *Schunke* Hacienda above San Ramón, *Killip & Smith* 24705 (F). **Madre de Dios:** Prov. Manú, Atalaya, *Foster & Wachter* 7461 (F). Prov. Manú, Cerro de Pantiacolla, Río Palotoa, *Foster et al.* 10694 (F).

5. *Asplenium pearcei* Baker, Syn. fil. ed. 2: 483. 1874. TYPE: Peru (Pasco), banks of Río Huancabamba, Pozuzo, *Pearce* 528 (holotype, K!; photo, F).

Asplenium amazonicum Christ, Hedwigia 45: 191. 1906. LECTOTYPE (designated here): Brazil, Rio Jurúa, *Ule* 5525 (P!; isoelectotype, K!; photo, F of

P). *Ule* 5525 (L!) is *A. stuebelianum* (mixed collection).

Asplenium haplophyllum Domin, Pterid. Dominica 170, t. 29, f. 1 (*Ule* 5525, K!). 1929.

Plants low-epiphytic, rarely terrestrial. **Stem** stout, erect or decumbent, provided with clathrate, gray-brown scales, these lanceolate, acuminate, 2–4 mm long and mostly 1 mm broad. **Leaves** fasciculate, 24–40 cm long, mostly long-petiolate, simple to trifoliate or (very rarely) with 2 pairs of pinnae. **Petiole** commonly 5–18 cm long, dull reddish or greenish brown, sparsely clathrate-scaly at base. **Lamina** thin- to firm-herbaceous, in pinnate leaves the apical segment conform but larger than lateral ones, sparsely to moderately provided with minute (0.1–0.2 mm), appressed, pluricellular trichomes, these often gland-tipped and visible only under high magnification, rachis (in pinnate specimens) and proximal part of petiole alate. **Pinnae** (when present) opposite or subopposite, narrowly and subequally cuneate at base, acute or acuminate at apex, narrowly adnate to the rachis, margins entire to crenulate. **Veins** 1–2-forked, indistinct. **Indusia** linear, green or yellow-green, entire.

In wet forests, low on tree trunks, on fallen logs, or rarely in wet, rocky soil, 100–500 m, San Martín and Loreto south to Puno.

Venezuela; the Guianas; Ecuador; Peru; Brazil.

Two strange occurrences have led to confusion attending the names of synonyms of *A. pearcei*. First, *Ule* 5525, one of the syntypes of *A. amazonicum*, represents a mixed collection, for the specimen at Leiden is *A. stuebelianum*, a distinct, albeit superficially similar, species. Second, Domin, obviously unaware of the identity of *A. amazonicum*, later created *A. haplophyllum*, based on *Ule* 5525 at Kew (here designated isoelectotype of the former name).

Specimens of *A. pearcei* with simple leaves have been confused with *A. serratum*, *A. angustum*, and *A. pseudoangustum*. It is distinguished from these three by the long petiole and thinner lamina and from the first two by lack of small, black scales along the costa abaxially.

San Martín: Prov. San Martín, road from Tarapoto to Yurimaguas, *Plowman* 6001 (GH, USM). Prov. Mariscal Cáceres, Tocache Nuevo, *Schunke* V. 7069 (F, MO, USM). **Loreto:** Gamitanacocha, Río Mazán, *J. Schunke* 305 (F, GH, UC, US). **Pasco** (as Junín): Cahuapanas, on Río Pichis, *Killip & Smith* 26736 (US). **Ucayali** (as Loreto): Río Aguaytía above mouth of Yurac-Yacu, *Croat* 20905 (MO). **Madre de Dios:** Prov. Tambopata, Albergue

Cuzco Amazónico, *Leon 890* (F, USM). **Puno:** Prov. Carabaya, Hacienda Palmera, Inambari, *Vargas 16142* (GH).

6. ***Asplenium escaleroense*** Christ, *Hedwigia* 44: 366. 1905. TYPE: Peru (Loreto), "Cerro de Escalero," *Ule 6886* (holotype, P; isotype, B?).

Plants epiphytic, occasionally epipetric. **Stems** minute, small and erect, often arising at subdistant intervals from long-creeping, stoloniform roots, scales lacking, or a few dark brown, clathrate ones at the petiole base. **Leaves** single, or several and fasciculate, 2–6(–9) cm long, 0.2–0.6(–1.0) cm broad. **Petiole** thin, 0.4–2 cm long, green or greenish brown. **Lamina** thin-herbaceous, linear or linear-lanceolate (or juvenile ones subflabellate to obovate), glabrous, shallowly lobed to pinnatifid, or rarely with a pair of lobed basal pinnae. **Segments** or lobes 2–6 pairs, strongly ascending. **Veins** simple in each segment, often indistinct. **Sori** one per segment. **Indusia** to 3 mm long and 0.5 mm broad, yellowish or greenish.

In rain forests, on trunks or branches of trees, or occasionally on wet rocks or cliffs near waterfalls, 130–1200 m; in Peru thus far known from the type and two other collections.

Colombia; Ecuador; Peru; Bolivia.

Scattered collections have been made of this species from Colombia to Bolivia, but the leaves are tiny and inconspicuous and therefore easily overlooked, so it is likely to be far more common within its reported range. It should be searched for throughout Peru in wet forests, on trees, and on rocks around waterfalls.

San Martín: Tarapoto–Yurimaguas Hwy., km 14–17, *McDaniel 13802* (GH). **Loreto:** Prov. Maynas, Yanamono Exploramo Tourist Camp, *van der Werff et al. 9923* (MO, UC).

7. ***Asplenium pumilum*** Sw., *Prodr.* 129. 1788. TYPE: *Swartz*, Jamaica (holotype, s).

Plants terrestrial or epipetric. **Stem** small, erect, provided at apex with filiform, blackish scales to 3 mm long. **Leaves** 1-pinnate or -pinnatisect, subcaespitose, mature ones 4–20 cm long, 1.5–6 cm broad. **Petiole** thin, 1–10 cm long, green to lustrous and castaneous or atropurpureous at base abaxially. **Lamina** firm-herbaceous to somewhat fleshy, not reduced at base, terminating in a nonconform, pinnatifid apex, provided, especially on rachis, veins, and margins, with few to many whitish, septate trichomes. **Pinnae** 1–4 pairs, sessile and

adnate distally, the proximal ones often short-stalked, subentire to crenate or lobed, basal pair the largest, more strongly produced basiscopically than acroscopically. **Veins** 1- or 2-forked, or pinnately branched in basal lobes. **Sori** linear or elliptic. **Indusia** thin, yellow to whitish.

Rare, in wet forests, on rocks, or on the forest floor, 400–1800 m, Tumbes, Huánuco, Cuzco.

United States (Florida); West Indies; Mexico to Panama; Venezuela and Colombia to Brazil and Argentina; Africa.

This is one of a few species in the genus having basal pinnae more strongly produced on the basiscopic side. This and the whitish, septate trichomes of the lamina easily separate it from other species in Peru. Although it is rarely collected, it is probably more common than thus far reported, as it is but another of the very inconspicuous species in *Asplenium*.

Tumbes: Between Caucho and Cotrina, *Coronado 221* (GH, UC). Between Tumbes and Caucho, *Coronado 225* (GH, UC). **Huánuco:** Yanano, *Macbride 3815* (F). **Cuzco:** Prov. La Convención, Potrero, *Bües 440* (US). Prov. La Convención, Playa de Balsa, *Mexia 8053b* (UC).

8. ***Asplenium formosum*** Willd., in L. Sp. pl. ed. 4, 5: 329. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, B, *Herb. Willd.* 19908; photos, F, GH).

Plants terrestrial, occasionally epipetric or epiphytic. **Stem** small, erect, provided with rigid, linear scales, these 1–3 mm long, obscurely clathrate, black with narrow, brown margins. **Leaves** 1-pinnate, caespitose, to 30 cm long and 2.5 cm broad. **Petiole** rather stout, 1.5–4 cm long, lustrous, black or atropurpureous, glabrous. **Lamina** firm-herbaceous to chartaceous, tapering to a pinnatifid apex, gradually narrowed at base to mere auricles, glabrous, lacking proliferous buds, rachis adaxially with narrow perpendicular wings. **Pinnae** numerous, 0.6–1.5 cm long, patent, sessile, narrow and subacute, subdimidiate, basiscopically cuneate at base and the margin entire to biserrate, acroscopically truncate and the margin biserrate to deeply and sharply incised. **Veins** simple or 1-forked, indistinct. **Sori** 1–3 to a pinna, elliptic to ovate, often confluent at maturity. **Indusia** pale green to whitish.

In wet forests, usually in loose soil of banks, occasionally on tree trunks or in crevices of wet

cliffs, 200–1200 m, Loreto, Junín, Ayacucho, Cuzco.

West Indies; Mexico to Panama; the Guianas to Colombia, south to Brazil and Argentina.

Loreto: Banks of Río Santiago above Pongo de Maneriche, *Mexia* 6318 (F, GH, MO, UC, US). **Junín:** Río Pinedo N of La Merced, *Killip & Smith* 23566 (F). Puente Quimirí, *León* 469 (USM). La Merced, *Macbride* 5373 (F). **Ayacucho:** Estrella, between Huanta and Río Apurímac, *Killip & Smith* 23077 (US). **Cuzco:** Prov. La Convención, Potrero, W of Quillabamba, *Tryon & Tryon* 5382 (GH). Prov. La Convención, Rosalina, *Vargas* 12288 (GH).

9. *Asplenium extensum* Fée, Mém. foug. 7: 51, t. 13. 1857. TYPE: Colombia, Ocaña, *Schlim* 629 (holotype, P; isotypes, L!, RB; frag., US! of L; photos, F, GH & US of L).

Plants terrestrial or epipetric. **Stem** short, erect or decumbent, provided with linear-lanceolate scales, these 1–2 mm long, obscurely clathrate, black, with narrow brown margins. **Leaves** 1-pinnate, subcaespitose, to 40 cm long and 2 cm broad. **Petiole** 3–5 cm long, terete, lustrous, atropurpureous to blackish, essentially glabrous. **Lamina** chartaceous to subcoriaceous, linear, strongly and gradually tapering to apex, not or rarely reduced at base, occasionally with proliferous buds at apex or in pinna axils. **Rachis** adaxially provided with strong parallel, winglike ribs, these conspicuously hirsute with rigid, spreading, castaneous trichomes to 0.3 mm long. **Pinnæ** numerous, to 1 cm long, patent, approximate to remote, sessile, oblong, subequilateral, margins entire or broadly and shallowly crenate. **Veins** obscure, but their tips commonly enlarged and conspicuous near the pinna margin. **Sori** 2–7 to a pinna, sometimes confluent at maturity. **Indusia** large, persistent, pale green to whitish.

In forests, in soil, or in crevices of wet, rocky, canyon walls, 1800–3950 m, Cajamarca and Amazonas to Junín.

Colombia; Peru.

Cajamarca: Prov. Celendín, canyon of Río Maraón above Balsas, *Hutchison & Wright* 5294 (F, GH, UC, US). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla above Leimebamba, *Hutchison & Bennett* 4546 (F, GH, UC, US). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young* 4224 (HUT). **Huánuco:** Yanano, *Macbride* 3831 (F, GH, US). Tambo de Vaca, *Macbride* 4380 (F, US). **Junín:** Prov. Chanchamayo, Mina Pichita, *van der Werff et al.* 8660 (MO, UC).

10. *Asplenium resiliens* Kunze, Linnaea 18: 331. “1844” (1845), *nom. nov.* for *Asplenium parvulum* Mart. & Gal. and with the same type.

Asplenium parvulum Mart. & Gal., Nouv. Mém. Acad. Roy. Sci. Bruxelles 15: 60. 1842, *nom. illeg.* (not Hooker, 1840). TYPE: Mexico, Oaxaca, *Galeotti* 6462 (holotype, BR, photos, BM, F, US; isotype, BR, photos, P, US).

Plants epipetric, rarely terrestrial. **Stem** short, erect, provided at apex with linear to filamentous, blackish scales, these 3–4 mm long, often with narrow brown margins, obscurely clathrate. **Leaves** 1-pinnate, densely caespitose, to 35 cm long and 2.5 cm broad. **Petiole** 1–5 cm long, lustrous, atropurpureous to blackish, essentially glabrous. **Lamina** subcoriaceous, linear, gradually reduced to base and diminished abruptly to a pinnatifid apex, lacking proliferous buds. **Rachis** adaxially with parallel ribs, each of these with a narrow but pronounced, foliaceous, green wing nearly throughout. **Pinnæ** numerous, large ones 0.5–1.2 cm long, patent to slightly deflexed, subsessile or short-stalked, elliptic or broadly oblong, inequilateral at base, cuculate basiscopically, truncate and often subauriculate acropically, margins entire to broadly crenulate. **Veins** obscure or indistinct, the tips not dilated. **Sori** several pairs to a pinna, mostly crowded at the pinna margins, usually confluent at maturity. **Indusia** broad, pale yellow to whitish, persistent, but often obscured at maturity by the numerous sporangia.

In forests, on ledges and in crevices of rocky cliffs, or on boulders, rarely in rocky soil, 1200–3500 m, Cajamarca and Amazonas south to Cuzco.

Southern United States; Jamaica; Hispaniola; Mexico; Guatemala; Colombia and Venezuela south to Argentina and Brazil.

Cajamarca: About 40 km from Cajamarca on road to Chilete, *Correll & Smith* P844 (GH, US), P844A (GH). **Amazonas:** Prov. Chachapoyas, Jazán (Ingenio-Chachapoyas), *López et al.* 4262 (GH, HUT). **La Libertad:** Prov. Sánchez Carrión, between Sausagocha and Cajabamba, *Smith & Vásquez* 3382 (MO, UC). **Ancash:** Prov. Carhuas, Cordillera Blanca, Valley of Río Marcará, *Hutchison & Wright* 4362 (F, GH, UC, US). **Huánuco:** Huacachi, estación near Muña, *Macbride* 3871 (F, GH, US). **Junín:** South of Huancayo, between Viques and Ingahuasi, *Killip & Smith* 22157 (F, US). **Apurímac:** 5 km above Huamcarama, *West* 3802 (UC). **Cuzco:** Road from “Ccasapata” (Casapata) to Apurímac, *Bües* 1388 (US).

11. **Asplenium monanthes** L., Mant. pl. 130. 1767.
TYPE: South Africa, Cape of Good Hope (holotype, LINN 1250.17; photo, US).

Plants epipetric, occasionally terrestrial, rarely epiphytic. **Stem** short, erect, provided at apex with filiform to narrow-deltate scales, these 1–5 mm long, gray-brown to blackish, scarcely to obviously clathrate. **Leaves** 1-pinnate, caespitose, to 60 cm long and 3 cm broad. **Petiole** 1–15 cm long, lustrous, dark brown, atropurpureous or blackish, essentially glabrous. **Lamina** firm-membranaceous to chartaceous, linear, tapering to a pinnatifid apex and strongly reduced at base. **Rachis** sparsely provided with dark, fibrillose scales, adaxially with 2 parallel raised ribs, not proliferous at apex but, in var. *wagneri*, often with scale-covered gemmae in a distal pinna axil. **Pinnae** (larger ones) to 1.5 cm long, sessile to minutely stalked, patent, blunt and quadrangular to subacute and falcate, inequilateral at base, often subauriculate acroscopically. **Veins**

- a. Ribs on adaxial side of rachis conspicuously pustulate or pustulate-dentate; stem scales 1–2(–3) mm long; a proliferous bud sometimes borne in a distal pinna axil 11c. var. *wagneri*
- a. Ribs on adaxial side of rachis entire to remotely and minutely denticulate; stem scales mostly 4–5 mm long; proliferous buds lacking b
- b. Stem scales commonly blackish, or with a narrow brown margin, not or obscurely clathrate; pinnae commonly 2–4 times as long as broad 11a. var. *monanthes*
- b. Stem scales commonly gray-brown, clathrate; pinnae 1–1.5(–2) times as long as broad 11b. var. *castaneum*

11a. **Asplenium monanthes** var. *monanthes*.

Asplenium monanthemum Murray, in L., Syst. veg. ed. 14: 933. 1784. *nom. superfl.* for *Asplenium monanthes* and with the same type.

Stem scales commonly 4–5 mm long, blackish, or with narrow brown margins, linear to filiform, not or obscurely clathrate, lamina narrow and their walls thick. **Leaves** to 60 cm long and 3 cm broad. **Petiole** atropurpureous (sometimes dark brown or blackish). **Rachis** with adaxial ribs entire to minutely denticulate, lacking proliferous buds. **Pinnae** (larger ones) mostly 2–4 times as long as broad, subentire to crenate or crenate-serrate.

In forests and thickets, on and among rocks, in crevices of rock cliffs, and occasionally in rocky soil, (900–)1300–4350 m, Lambayeque to Amazonas, south to Ayacucho and Madre de Dios.

Southern United States; Jamaica; Hispaniola; Mexico to Panama; Colombia and Venezuela south to Argentina and Chile; Hawaii; Africa.

often indistinct, but their tips conspicuous and somewhat to strongly dilated adaxially. **Sori** solitary near the basiscopic pinna margin, or borne in several pairs, often confluent at maturity. **Indusia** broad, pale green to whitish, persistent, but often obscured at maturity by spreading sporangia.

The Southern United States; Jamaica; Hispaniola; Mexico south to Panama; Colombia and Venezuela south to Argentina and Chile; Hawaii; Africa.

Authors have recognized *Asplenium monanthes* and two closely related species separated by a few, mostly quantitative, features. Some of these characters are relatively constant in certain parts of the range, but variable in other areas, and intermediate specimens are not uncommon. (See discussion of var. *monanthes* for detailed comparison of characters.) In this treatment the three taxa are recognized as geographical or elevational variants, a key to which is provided here:

The range of var. *monanthes* is very broad; it occurs at middle to very high elevations in Peru. Variety *castaneum* does not occur in the Old World, the West Indies, or middle Central America, is (with a few exceptions) confined to Andean regions in South America, and is found mostly over 3000 m in Peru. Variety *wagneri* thus far has been found only in Colombia and Ecuador, and in Peru commonly between 3000 and 3800 m. The last has the smallest leaves of the three varieties and is easiest to recognize because of the pustulate rachis ribs, the much smaller stem scales, and the occasional rachis buds. Darker clathrate scales, darker petioles, and relatively narrower pinnae usually distinguish var. *monanthes* from var. *castaneum*, but all these vary frequently enough so that comparison of a suite of characters is usually necessary for positive identification. Some characters seem to be more constant in certain geographic areas than in others; consequently, the above key is especially designed to separate the varieties in Peru.

Lambayeque: Prov. Ferreñafe, Quiros 2521 (F). Ca-

jamarca: Prov. Celendín, Pumarrume, *Mostacero et al.* 1011 (F, GH, HUT, UC). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla, above Balsas, *Hutchison & Wright* 5824 (F, GH, UC, US, USM). **La Libertad:** Prov. Santiago de Chuco, 26 km from Santiago, *D. Smith* 2334 (F, MO). **San Martín:** Dist. Huallaga, Valley of Río Aposoncho, *Hamilton & Holligan* 500 (US), 914 (US). **Ancash:** Prov. Corongo, Nueva Victoria, *Mostacero et al.* 2009 (F, HUT). **Huánuco:** Muña, *Macbride* 3939 (F, GH, US). **Lima:** Prov. Yauyos, Laguna Huacracocha, *Cerrate* 1255 (USM). **Pasco:** Huariaca, *Bryan* 169 (F). **Junín:** Prov. Tarma, 5 km SW of Huacapistana, *Tryon & Tryon* 5425 (F, GH, US). **Ayacucho:** Prov. Huamanga, Totorabamba, *Weberbauer* 5469 (GH). **Apurímac:** Prov. Abancay, forests of Ampay, *Vargas* 1068 (F, GH). **Cuzco:** Prov. Urubamba, near town of Machu Picchu, *Tryon & Tryon* 5405 (F, GH, US). **Madre de Dios:** Piñasnioj, Panticalla [Pantiacolla?] Pass, *Cook & Gilbert* 1798 (US).

11b. *Asplenium monanthes* var. *castaneum* (Schlecht. & Cham.) Stolze, *Flora of Ecuador* 23: 45. 1986.

Asplenium castaneum Schlecht. & Cham., *Linnaea* 5: 611. 1830. TYPE: Mexico, Veracruz, Mt. Orizaba, *Schiede* (holotype, HAL; frag., NY!).

Stem scales commonly 4–5 mm long and gray-brown, linear to narrow-deltate, usually conspicuously clathrate, the lumina broad and clear and the walls thin. **Leaves** to 35 cm long and 2 cm broad. **Petiole** dark brown, sometimes castaneous, rarely atropurpureous. **Rachis** with adaxial ribs subentire, lacking proliferous buds. **Pinnae** (larger ones) 1–1.5(–2) times as long as broad, subentire to crenate.

In forests, on rocks and in crevices of rock cliffs, and sometimes in rocky soil, (600–)2900–4700 m, Cajamarca and Amazonas south to Huancavelica and Puno.

Southern Mexico; Guatemala; Costa Rica; Panama; Venezuela and Colombia south to Bolivia.

Authors often distinguish this from var. *monanthes* by the petiole color. Petioles of var. *castaneum* usually are dark brown and those of var. *monanthes* atropurpureous, but, at least in Peru, petioles on the same stem can be of both colors. Furthermore, Stolze (1981) pointed out that in Guatemala the short pinna stalks were usually green in "*A. monanthes*," but often partly brown in "*A. castaneum*." This character is useless in Peru, as pinna stalks are nearly always concolorous in both varieties.

Cajamarca: Prov. Contumazá, Jalca El Chuno, *Sagástegui et al.* 9368 (F, MO). **Amazonas:** Prov. Chachapoyas, Cerro Campanario, *Wurdack* 1558 (GH, UC, US).

La Libertad: Prov. Santiago de Chuco, near Santiago, *Sagástegui et al.* 11708 (HUT). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León* 4576 (USM). **Ancash:** Prov. Yungay, near Laguna Llanganuco, *Mostacero et al.* 1401 (F, HUT, MO). **Lima:** Prov. Huarochiri, Dist. San Mateo, Río Blanco, *Saunders* 404 (F, UC). **Pasco:** Between La Quinua and Tambo, *Soukup* 5627 (US). **Junín:** Mt. La Juntay, near Huancayo, *Killip & Smith* 22058 (GH, US). **Huancavelica:** Prov. Castrovirreina, Choclococha, *Tovar* 2842 (USM). **Cuzco:** Prov. Espinar, Imantata, *Vargas* 10509 (GH). **Puno:** Granja Salcedo, Cañon Viscachani, *Mexia* 4263 (UC).

11c. *Asplenium monanthes* var. *wagneri* (Kuhn) Stolze, *Flora of Ecuador* 23: 46. 1986.

Asplenium wagneri Kuhn, *Linnaea* 36: 96. 1869. TYPE: Ecuador, Pichincha, near "Turtillas" between Quito and Esmeraldas, *Wagner* (holotype, M; isotype, BM; photos, BM & UC of M, GH of BM).

Asplenium vargasii Abbiatti, *Darwiniana* 14: 61, t. 1. 1966. TYPE: Cuzco, "Sajasaihuaman" (Saxihuamán), *Vargas* 362 (holotype, LIL).

Stem scales 1–2(–3) mm long, blackish, linear or narrow-deltate, not or obscurely clathrate. **Leaves** to 22 cm long and 1.3 cm broad. **Petiole** castaneous or atropurpureous. **Rachis** with adaxial ribs conspicuously pustulate or pustulate-dentate, sometimes with a proliferous bud in one of the distal pinna axils. **Pinnae** 1–1.5 times as long as broad, subentire to crenate or crenate-serrate.

In forests, on rocks or in crevices or rock cliffs, or in rocky soil, (2700–)3000–3800(–4350) m, Ancash, Junín, Cuzco.

Venezuela; Colombia; Ecuador; Peru.

In Ecuador, pinnae are sometimes deeply crenate to shallowly lobed, but in specimens from Peru they are commonly merely crenate-serrate. The type of *A. vargasii* has not been examined, but the diagnostic features of var. *wagneri* (deeply dentate rachis ribs and short stem scales) are clearly indicated in the former's description and illustration.

Ancash: Prov. Bolognesi, Cochacután, at the foot of "El Carnicero," *Cerrate* 2294 (GH). **Junín:** Prov. Huancayo, Dist. Huancayo, foot of Nevada Huaytapallana, *Saunders* 1165 (GH). **Cuzco:** Prov. Cuzco, Hills of Saxihuamán, *Herrera* 1349 (US), 2370 (F), 2380 (F). Prov. Cuzco, Saxihuamán, *Tryon & Tryon* 5348, in part (GH, US).

12. *Asplenium rutaceum* (Willd.) Mett., *Abh. Senckenberg Naturf. Ges.* 3: 173. 1858.

Aspidium rutaceum Willd., *Sp. pl. ed.* 4, 5: 266. 1810. TYPE: *Plumier*, *Traité foug. Amér. t.* 57. 1805.

Asplenium perkinsii Jenman, Gard. Chron. 3, 19: 8. 1896. TYPE: Guyana (as British Guiana), Kaeteur Falls, *Perkins* (holotype, NY!).
Asplenium conquistum Christ, Bull. Herb. Boissier 2, 7: 270. 1907. LECTOTYPE (designated by Maxon, Contr. U.S. Natl. Herb. 10: 488. 1908): Jamaica, *Maxon 1558* (p; isoelectotype, us!).

Plants epiphytic or terrestrial. **Stem** erect, provided with linear or lanceolate scales, these to 3 mm long, clathrate, castaneous or gray-brown. **Leaves** 2–3-pinnate, rigid, fasciculate, to 40 cm long and 10 cm broad. **Petiole** 0–2 cm long, lustrous, castaneous to atropurpureous, glabrous. **Lamina** thin-herbaceous, gradually reduced to a naked and flagelliform apex, this often with a proliferous and radican tip, strongly reduced at base, surface apparently glabrous but sparsely provided abaxially with minute, appressed trichomes. **Rachis** lustrous, dark brown or atropurpureous, narrowly alate adaxially. **Pinnae** 15–32 pairs, patent to slightly ascending, or proximal ones deflexed, sessile, the basal pinnules commonly overlapping the rachis. **Pinnules** 6–10 pairs, inequilateral at base, with several pairs of spatulate or obovate segments, their apices obtuse to acute (occasionally apiculate). **Veins** simple in most ultimate segments. **Sori** solitary on the vein of each segment. **Indusia** thin, subentire, yellowish or greenish.

In wet forests, on tree trunks, in humus, or on banks of ravines, 800–2600 m, Cajamarca and Amazonas south to Cuzco.

Greater Antilles; southern Mexico to Panama; the Guianas to Colombia and south to Bolivia.

This is often confused with other 2–3-pinnate species of *Asplenium* in Peru, such as *A. myriophyllum* and *A. radicans* var. *uniseriale*. However, only *A. rutaceum* has the combination of such diagnostic features as: petiole dark, lustrous, and nearly obsolete; lamina strongly reduced at base and apex, with a naked, flagelliform, and usually radican tip.

Lellinger (Proc. Biol. Soc. Wash. 98: 372. 1985) separated *A. maxonii* Lell. from *A. rutaceum* in South America and southern Central America on a number of subtle characters and cited one paratype from Peru: *Woytkowski 34518* (us). However, upon reexamination, he has advised (pers. comm.) that the latter is actually *A. rutaceum*, thus *A. maxonii* has not yet been found in Peru. The latter is presumed to differ in having adnate ultimate segments and the basal acroscopic lobe of pinnules usually bifid. Ultimate segments of *A. rutaceum* are short-stalked, and basal lobes are

never bifid. Other features cited in the original description of *A. maxonii* vary too greatly in Peruvian specimens to be of significant value.

Cajamarca: Prov. Jaen, above Tabaconas, Quebrada de Pajónal, *Fosberg 27803* (us). **Amazonas:** Prov. Bagua, E of La Peca, *Barbour 2821* (f, mo, us). **San Martín:** Prov. Rioja, Venceremos, *D. Smith 4432* (f, mo, uc). **Huánuco:** Prov. Leoncio Prado, between Tingo María and Pucallpa, *Sullivan & Young 1159* (mo). **Pasco:** Prov. Oxapampa, trail to summit of Cordillera Yanachaga, *D. Smith et al. 7815* (f, mo, usm). **Junín:** Prov. Tarma, Río Palca Valley, *Hodge 6299* (gh). **Ucayali** (as Huánuco): Divisoria, *Woytkowski 34518* (uc, us). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, *Wachter et al. 187* (f).

13. *Asplenium hallii* Hooker, Sp. fil. 3: 202. 1860. TYPE: Ecuador, forest of Esmeraldas, *Hall* (holotype, k!, frag., b; photo, us of b). **Figures 1b-d.**

Asplenium spruceanum Hieron., Hedwigia 60: 260. 1918. TYPE: Brazil, San Gabriel, *Spruce 2357* (not 2375 as in protologue) (holotype, b!, frag. us!; isotype, gh!).

Plants epiphytic. **Stem** rather stout, erect or decumbent, provided with linear-lanceolate scales, these 2–3 mm long, clathrate, dark brown to blackish. **Leaves** 1-pinnate-pinnatifid or -pinnatisect, erect, fasciculate, 18–40 cm long, (1.5–)2–9 cm broad. **Petiole** 1–6 cm long, lustrous, castaneous to atropurpureous, glabrous. **Lamina** thin- to firm-herbaceous, glabrous, gradually reduced to apex and base, the tip attenuate, usually flagelliform and/or proliferous, rachis dark and lustrous. **Pinnae** 20–30 pairs, larger ones (1.5–)2–4 cm long, patent, or a few proximal ones deflexed, sessile, pinnatifid, or incised nearly to the costa at base, the basal acroscopic segment commonly overlapping the rachis. **Veins** simple in most segments, forked to pinnate in basal ones. **Sori** solitary on each vein. **Indusia** thin, yellowish or greenish.

In deep forests, on stumps or tree trunks and branches, 100–200 m, San Martín and Loreto.

Colombia; Ecuador; Peru; Amazonian Brazil.

Some confusion has attended the nomenclature and descriptions of this species and its synonym. Hieronymus separated his *A. spruceanum* from *A. hallii* on the basis of several quantitative characters and cited as its type a paratype of the latter (incidentally citing the number incorrectly as 2375). During the present study, comparison of the type material showed there is no reason to recognize

two species. Furthermore, in the protologue, following the description of *A. hallii*, Hooker made a curious statement: "My specimens from Col. Hall have the pinnae again pinnated, especially in the lower half . . ." The Hall specimen at Kew exhibits nothing of the kind and, in fact, is identical to *Spruce 2357*, except the pinnae are less deeply incised and the segments a little broader.

Mexia 6184 (F, GH, MO, UC, US) from Loreto has dull, gray-green rachis and petiole, stem scales light brown and ovate, and roots somewhat golden-tomentose (all characters similar to those of *A. auriculatum*) but otherwise matches *A. hallii*. This may be a hybrid involving the two species, for many sporangia are barren or with some spores malformed.

San Martín: Lamas, Santa Rosa de Davidcillo, near road to Tioyacu, *Knapp & Mallet 7195* (F, MO, UC). **Loreto:** Mishuyacu, near Iquitos, *Killip & Smith 29975* (F, GH, US). Prov. Maynas, Mishara, *López et al. 8650* (HUT). Prov. Requena, Jenaro Herrera, N of Requena, *Tovar 6968* (USM). La Victoria on the Amazon River, *Ll. Williams 2989* (F, US).

14. *Asplenium macrurum* Mickel & Stolze, in Stolze, *Flora of Ecuador* 23: 41. 1986, *nom. nov.*

Asplenium longicaudatum Mickel & Stolze, *Amer. Fern J.* 74: 115. 1984, *nom. illeg.*, not *A. longicaudatum* Bonaparte. 1917. TYPE: Ecuador, Prov. Morona-Santiago, Cordillera Cutucú, *Camp E-1283* (holotype, NY!; isotype, s).

Plants terrestrial or low-epiphytic. **Stem** stout, decumbent to erect, provided with ovate to lanceolate, acute scales, these 2–4 mm long, 0.6–1 mm broad, dark brown or gray-brown, or often bicolorous with narrow, lighter brown margins, subclathrate, the lumina isodiametric or slightly elongated. **Leaves** 1-pinnate, fasciculate, to 1 mm long and 18 cm broad. **Petiole** 10–30 cm long, lustrous or sublustrous, dark brown to atropurpureous, essentially glabrous. **Lamina** thin- to firm-herbaceous, glabrous, lanceolate or deltate-lanceolate, not or scarcely reduced at base, gradually reduced to a long, flagelliform apex. **Rachis** glabrous, not alate, dark reddish brown, the flagelliform tip often proliferous but fragile and usually broken off in dried specimens. **Pinnae** 10–17 pairs, to 12 cm long and 1.8 cm broad, sessile or short-stalked, equilateral except at base, there broadly cuneate to truncate acroscopically, narrow-cuneate basiscopically, the apex narrowly acute to attenuate, margins subentire to broadly crenulate.

Veins 1(–2)-forked. **Sori** 5–8 mm long, linear or narrow-oblong, slightly arcuate. **Indusia** yellowish, firm, subentire.

On the floor of deep, wet forests or at the base of tree trunks, 1000–1700 m, Amazonas, Ucayali. Venezuela; Ecuador; Peru.

Heretofore known only by the type collection from Ecuador, several collections of the species now have been made in Peru. It is similar in appearance to *A. radicans* var. *cirrhatum* but differs significantly in stem scales and in size and shape of pinnae. The Peruvian, especially Schunke, collections closely match the type, but pinnae of the two Barbour specimens are not attenuate as on the type; they are merely narrow-acute.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour 2404* (MO, UC), *2501* (UC). **Ucayali** (as Loreto): Prov. Coronel Portillo, Dist. Padre Abad, Río Chino, *J. Schunke V. 9197* (MO, UC).

15. *Asplenium radicans* L., *Syst. nat. ed.* 10, 2: 1323. 1759. LECTOTYPE (designated by Morton & Lellinger, *Mem. New York Bot. Gard.* 15: 38. 1966): Jamaica, *Browne 92* (LINN 1250.16, right-hand specimen; photo, US).

Plants terrestrial, rarely epiphytic or epipetric. **Stem** stout, erect, provided at apex with linear or lanceolate, attenuate, clathrate scales, these 2–5 mm long, gray-brown to blackish. **Leaves** 1-pinnate to 3-pinnate-pinnatisect, fasciculate, to 1 m long and 25 cm broad. **Petiole** 10–30 cm long, lustrous, dark brown to atropurpureous, essentially glabrous. **Lamina** thin- to firm-herbaceous, lanceolate to deltate-ovate, not or scarcely reduced at base, gradually tapering to a radican apex. **Rachis** essentially glabrous, bisulcate adaxially, not or conspicuously green-alate, lustrous, terminating in a naked and flagelliform apex. **Pinnae** numerous, extremely variable: simple, entire to crenate-serrate and commonly 2–5 cm long by 1 cm broad in var. *cirrhatum*, to 3-pinnate and 12–15 cm long by 4–5 cm broad in var. *uniseriale*; sessile or subsessile, patent to slightly ascending. **Veins** commonly 1–2-forked, or simple in ultimate segments of decompound varieties. **Sori** elongated, or moderately so in decompound varieties. **Indusia** thin, yellowish or greenish, oblong to elliptic, the margins subentire.

The species occurs in the West Indies, and from Mexico to Bolivia and Brazil.

Few fern species are as highly variable in lamina architecture as *Asplenium radicans*. A combination of features distinguish it from other species in the genus: lustrous, atropurpureous petiole and rachis; flagelliform, proliferous leaf tips; scarcely reduced lamina base. However, the lamina may be simply pinnate, or 3-pinnate, or varying in an infinite number of degrees between each extreme. This has prompted some authors to recognize four or more species, each based solely on very subtle differences. Obviously, questions posed by this and similar aggregate species cannot be satisfactorily

resolved by comparison of herbarium specimens, within the limitations of a floristic treatment. Field and greenhouse observations coupled with cytological studies are needed. A good beginning was made by Walker (Trans. Roy. Soc. Edinburgh 66: 169–237. 1966; and 69: 109–235. 1969), who revealed that some crossing is involved within and also out of the species complex.

Tentatively, four varieties are recognized, which may or may not represent geographic or ecological taxa.

Key to Varieties

- a. Lamina 1-pinnate or 1-pinnate-pinnatisect. Secondary segments (if any) adnate to a broadly alate costa b
 - b. Pinnae lobed to deeply pinnatisect (but not dissected entirely to the costa) .. 15a. var. **radicans**
 - b. Pinnae entire to deeply crenate-serrate, not lobed, not or rarely auriculate 15b. var. **cirrhatum**
- a. Lamina 2- to 3-pinnate, at least the larger secondary segments definitely stalked c
 - c. Pinnae 1-pinnate (at least in proximal half), the pinnules coarsely dentate to deeply pinnatisect 15c. var. **partitum**
 - c. Pinnae 1-pinnate-pinnatisect to 2-pinnate, the pinnules (at least proximal one) with 1–several free segments 15d. var. **uniseriale**

15a. *Asplenium radicans* var. **radicans**.

Asplenium rhizophyllum L., Sp. pl. 1540. 1763, based on the same protologue as *A. radicans*. Not *A. rhizophyllum* L., 1753.

(For full list of synonyms of *A. radicans* and varieties, see Morton and Lellinger, 1966.)

Pinnae pinnatifid to deeply pinnatisect, basal segments often free, but not fully stalked, obtuse to subacute, subentire to dentate distally.

Rare, on slopes or ravine banks in wet forests, 600–2300 m, Amazonas, San Martín, Huánuco.

West Indies; southern Mexico south to Brazil and Bolivia.

Degree of lamina dissection merges gradually into that of var. *partitum*, the subtle distinction here being that the latter has clearly stalked secondary segments with coarsely dentate apices.

Amazonas: Prov. Bongará, Shillac, *D. Smith & Vásquez* 4839 (MO, UC). **San Martín:** Mt. Guayrapurima, near Tarapoto, *Spruce* 4021 (BR, GH, US). **Huánuco** (as San Martín): East of Tingo María, *Allard* 21562 (GH).

15b. *Asplenium radicans* var. **cirrhatum** (Willd.) Rosenst., *Hedwigia* 46: 102. 1906.

Asplenium cirrhatum Willd., Sp. pl. ed. 4, 5: 321.

1810. TYPE: Guadeloupe, *L. C. Richard* (holotype, B, *Herb. Willd.* 19894, frag., NY!; isotype, P; photos, F, GH, US of B).

Pinnae entire to deeply crenate-serrate, acroscopically truncate and sometimes subauriculate, basiscopically narrow-cuneate to excavate.

In forests, on sandy or rocky soil, or on old logs or bases of tree trunks, 300–1700 m, Amazonas and Loreto to Cuzco and Puno.

Guadeloupe; Greater Antilles; southern Mexico; Guatemala; Nicaragua to Brazil and Bolivia.

Amazonas: Prov. Bagua, valley of Río Marañón above Cascadas de Mayasi, *Wurdack* 1871 (GH, US). **San Martín:** Prov. Mariscal Cáceres, Dist. Uchiza, SE of Nuevo Progreso, *Schunke* V. 3159 (F, GH). **Loreto:** Valseca-Rudolpho, along Río Corrientes, *McDaniel & Marcos* 11061 (GH, MO). **Huánuco:** Prov. Leoncio Prado, Castillo Alto, *Plowman* 5849 (F, GH, USM). **Pasco:** Prov. Oxapampa, Palcazú Valley, between Iscozacín and Villa America, *D. Smith* 3871 (MO, UC). **Junín:** Schunke Hacienda, above San Ramón, *Killip & Smith* 24577 (F, GH). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, *Wachter et al.* 201 (F, USM). **Madre de Dios:** Tambopata Nature Reserve, between the lodge and Río la Torre, *Funk et al.* 8377 (UC, US). **Puno:** Prov. Carabaya, Palmera, *Vargas* 16150 (GH).

15c. *Asplenium radicans* var. **partitum** (Klotzsch) Hieron., *Bot. Jahrb. Syst.* 34: 464. 1904.

Asplenium flabellulatum var. *dentatum* Klotzsch, Linnaea 9: 71. 1834. SYNTYPES: Columbia [Venezuela], Moritz 44 (B?, P!; photos, F & US of P). Venezuela, prope Caracas (B?).

Asplenium flabellulatum Kunze var. *partitum* Klotzsch, Linnaea 20: 357. 1847. LECTOTYPE (designated by Morton & Lellinger, Mem. New York Bot. Gard. 15: 37. 1966): Venezuela, Caracas, Otto 651 (holotype, B; photo, US).

Asplenium partitum (Klotzsch) C. Chr., Index fil. 125. 1905.

Asplenium radicans var. *dentatum* (Klotzsch) Bonap., Notes Pteridologiques 7: 349. 1918.

Pinnæ 1-pinnate, with at least several pairs of free pinnules, these coarsely dentate and often deeply incised.

On slopes and ravine banks of wet forests, 650–2400 m, Amazonas, Huánuco, Pasco, Junín, Cuzco.

West Indies; Mexico south to Peru and Bolivia.

Stolze (1986) had not seen type material but cited *A. flabellulatum* as a synonym of var. *partitum*, based on the original description. However, having now examined the lectotype (with fully tri-pinnate lamina), it can be seen that the former name is more properly placed under var. *uniseriale*. This is typical of the confusion surrounding the many names and variants of *A. radicans*, all of which have been distinguished merely on minute degrees of variation in lamina dissection.

Amazonas: Prov. Bongará, Shillac, Smith & Vásquez 4893 (MO). **Huánuco:** La Divisoria, 25 km NE of Tingo María, Moran 3700 (MO). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, Río San Alberto, León 633 (F, GH). **Junín:** Chanchamayo Valley, C. Schunke 109 (F), 110 (F), 1452 (F). Above San Ramón, C. Schunke A211 (UC). **Prov. Tarma,** Agua Dulce, Woytkowski 35429 (MO, UC). **Cuzco:** Torontoy, Urubamba Valley, Cook & Gilbert 1097 (US). **Prov. La Convención,** Río Apurímac, Davis et al. 1299 (F, GH).

15d. *Asplenium radicans* var. *uniseriale* (Raddi) Gómez, Brenesia 8: 53. 1975.

Asplenium uniseriale Raddi, Opusc. Sci. 3: 291. 1819. TYPE: Brazil, Raddi (holotype, FI).

Asplenium flabellulatum Kunze, Linnaea 9: 71. 1834. TYPE: Peru, Pampayacu (Huánuco), Poeppig (holotype, LZ, destroyed; lectotype, B!, frag., US!, photo, US).

Pinnæ 2–3-pinnate, with basal pinnules strongly overlapping the rachis, most pinnules with 1 to several free segments, these obovate to cuneiform, or once again pinnate.

Terrestrial in and at edges of forests, 100–2700 m, Cajamarca to Loreto, south to Huancavelica and Cuzco.

West Indies; southern Mexico to Brazil and Bolivia.

With this probably should be included *A. boliviani* Rosenst. of Bolivia, which Rosenstock distinguished from *A. uniseriale* as having slightly less divided laminae (2-pinnate-pinnatifid). *Asplenium radicans* var. *uniseriale* (including *A. flabellulatum*) has laminae 3-pinnate or more. Detailed analysis of the species complex is needed. Studies by Stolze in Guatemala and Ecuador, and now in Peru, have revealed no other morphological characters or ecological data to corroborate differences in degree of lamina dissection. Monographic study possibly may substantiate the premise that *A. radicans* is merely a species with highly varied leaf architecture, whether this conclusion is “convenient” to classification or not.

Cajamarca: Prov. Cutervo, Grutas de San Andrés, Llatas Quiroz & Suarez 2735 (F, UC). **Amazonas:** Prov. Bagua, Cordillera Colón SE of La Peca, Barbour 4003 (MO). **San Martín:** Zepelacio, near Moyobamba, Klug 3489 (F, GH, MO), 3490 (B). **Loreto:** Mishuyacu, near Iquitos, Klug 208 (F), 392 (F). **Huánuco:** Prov. Huánuco, Carpath, Asplund 12835 (S). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, Río San Alberto, León 651 (F, GH, USM). **Junín:** Chanchamayo Valley, C. Schunke 830 (F), 1399 (F). **Huancavelica:** Prov. Tayacaja, Marcavalle, Tovar 4755 (GH). **Cuzco:** Río Tacate, Bües 1745 (US).

16. *Asplenium repens* Hooker, Sec. cent. ferns, t. 31. 1860. TYPE: Ecuador (Napo), growing in woods in Archedona, Jameson 787 (holotype, K!). (*Jameson* 786 cited in the protologue.)

Plants epiphytic, rarely terrestrial. **Stems** minute, borne on long-creeping, stoloniform roots. **Leaves** remote, borne singly, or occasionally in pairs, 2-pinnate (at least proximal ones), 1.5–5 cm long. **Petiole** to 0.5 cm long, yellow- or gray-green, at the base bearing a few, inconspicuous scales, these castaneous, clathrate, ovate, about 0.5 mm long. **Lamina** membranaceous, oblong or deltate-oblong, reduced to a pinnatifid apex, not or scarcely reduced at base. **Rachis** glabrous, lacking proliferous buds. **Pinnæ** 4–8 pairs, approximate or subdistant, stalked, essentially pinnate, typically with only a single pinnule borne on the acroscopic side of the costa (thus nearly bifoliate), ultimate segments about 3 mm long, cuneate, flabelliform, subdigitately incised at apex. **Veins** commonly 1-forked in each ultimate segment. **Sori** solitary

on each ultimate segment. **Indusia** thin, broad, yellowish or greenish brown, entire.

Rarely collected in Peru, on trunks or branches of trees, rarely on wet ground or mossy rocks, 1700–1800 m, Huánuco, Junín, Cuzco.

Colombia; Ecuador; Peru; Bolivia.

Jameson 786 was cited as the type by Hooker, and he also referred to it in *Species Filicum* (3: 194. 1860). However, the specimen in the holotype folder is 787. A diligent search by Peter Edwards (K), as well as a canvass of other herbaria, failed to yield a collection numbered 786. Thus, it appears likely Hooker erred in citing the type number.

Although shape of ultimate segments and lamina of *A. repens* are quite different from those of *A. delicatulum*, the two species are very closely related. Both have small, delicate and glabrous leaves borne on stoloniform roots, with a few clathrate petiole scales about 0.5 mm long. That neither species is well represented in herbaria is probably because they are so small and inconspicuous.

Huánuco: Prov. La Divisoria, 25 km NE of Tingo María, *Moran & Fernández 3704* (MO, UC, USM). **Junín:** La Merced, Chanchamayo, *Soukup 1009* (F). **Cuzco:** Tablahuas, Lucumayo Valley, *Bües 1034* (US).

17. *Asplenium triphyllum* Presl, Reliq. haenk. 1: 45. 1825. TYPE: “Hab. in Cord. Peru” (but possibly Ecuador), *Haenke* (holotype, PR!; photo, F).

Asplenium tenue Presl, Reliq. haenk. 1: 44, t. 6, f. 5. 1825. TYPE: Ecuador (as Peru), monte Chimborazo, *Haenke* (holotype, PR!; isotype, PR!; probable isotype, NY!; photos, F & GH of PR, GH of NY).

Asplenium ternatum Presl, Reliq. haenk. 1: 45. 1830. TYPE: in vallibus cordillerarum Peruviae, *Haenke* (PR!).

Asplenium rhomboideum Brack., U.S. expl. exped. 16: 156, t. 21, f. 2. 1854. TYPE: (Huánuco) Peru, Andes of Baños, *Brackenridge 24* (holotype, US!).

Plants epipetric, rarely terrestrial. **Stem** small to stout, provided with linear or linear-lanceolate scales, these obscurely clathrate, 1–2 mm long, blackish. **Leaves** fasciculate to densely caespitose, (4–)6–30 cm long, 0.5–1.8 cm broad. **Petiole** 1–10 cm long, dull, or rarely sublustrous, gray-brown to castaneous, sparsely provided with minute, glandular trichomes. **Lamina** thin-herbaceous to chartaceous, linear, gradually tapering to a pin-

natifid apex, abruptly to gradually reduced at base. **Rachis** rigid to flexuous, sparsely to moderately provided with filiform scales and pluricellular trichomes, not or inconspicuously alate, often bearing a proliferous bud in a pinna axil. **Pinnae** numerous, sessile to short-stalked, subdistant to densely crowded, most of them trifoliate or bifoliate, or occasionally with another pair of lateral pinnules, ultimate segments obovate or oblanceolate, entire to bifid. **Veins** simple (rarely 1-forked) in each ultimate segment. **Sori** solitary on the vein of each segment. **Indusia** thin, pale yellowish or translucent, subentire.

In crevices and ledges of rock walls, at cave mouths, among rocks and boulders, rarely in wet, mossy, soil, (2800–)3100–4800 m, from Cajamarca south to Arequipa and from Huánuco south to Puno.

Colombia to Bolivia and Argentina.

The taxonomy of this species and its near relatives has been very confused; consequently, a rather lengthy discussion is in order here. The type collection of *A. tenue* cited above contains leaves merely 2–4 cm long and 0.6–0.8 mm broad, and Stolze (1986) thought they closely resembled those of *A. fragile* (= *A. peruvianum*). Although pinnae are not conspicuously trifoliate, close examination reveals that many of them are deeply cleft; therefore, they resemble many of the smaller, bifoliate pinnae of *A. triphyllum*. The stem scales of the holotype of *A. tenue* are scarcely or very narrowly clathrate, like those of *A. triphyllum*, and not obviously clathrate like those of *A. peruvianum*. Thus, it seems that *A. tenue* is nothing more than a depauperate form of *A. triphyllum*.

The types of both *A. tenue* and *A. triphyllum* were collected by Haenke, and on the labels are marked “Peru.” However, boundaries of the two countries were often confused, and the protologue of the former cited that the plants were actually collected in Monte Chimborazo, which is in Ecuador. Presl based his descriptions of both species on the Haenke collections in hand, and it is quite conceivable that Haenke found both at the same collecting site. Despite the fact that these plants evidently represent extreme forms of the same species, Presl chose to describe them as different.

Asplenium trilobatum C. Chr. of Bolivia is very closely related and also may be merely a depauperate form.

Other variability in leaves of *Asplenium triphyllum* similarly prompts their recognition as different species. At one extreme, the stem is rather

small, the rachis slender and flexuous, and the pinnae thin-herbaceous and subdistant; in other leaves (as in the type of *A. ternatum*), the stem is stout, the rachis stout and rigid, and the pinnae chartaceous and crowded (even imbricate). When proliferous buds are present, they tend to be found only on the thin and flexuous leaves. Nevertheless, it is doubtful that two distinct taxa are represented here, as too many intermediate conditions occur, and the extreme forms may simply indicate leaf development responding to different habitats. Field studies are needed to corroborate this.

Besides being closely related to *A. peruvianum*, *A. triphyllum* also is part of a variable species complex involving *A. myriophyllum*, *A. haenkeanum*, and perhaps some others; in fact, several specimens in Peru are intermediate between *A. triphyllum* and *A. haenkeanum*. See treatment of the latter for further discussion.

Cajamarca: Prov. Cajamarca, Cerro "Cumbe Mayo," *Sánchez V. 39* (GH, HUT, US). **La Libertad:** Prov. Santiago de Chuco, Laguna La Victoria, *Sagástegui et al. 6189* (GH, HUT). **Ancash:** Prov. Huari, Huascarán National Park, *D. Smith et al. 12411* (F, MO). **Huánuco:** Chasqui, *Macbride & Featherstone 1757* (F, GH, US). **Lima:** Prov. Huarochirí, above Chumpicocha, *Cerrate 2005* (F, GH, USM). **Junín:** Road from Tarma to La Oroya, *Correll & Smith P786* (GH, US), *P787* (GH, MO). **Huancavelica:** Prov. Tayacaja, Tocas, between Colcabamba and Paucarbamba, *Tovar 2103* (GH, USM). **Ayacucho:** Between Quinua and road to Tambo, *Soukup 6185* (US). **Cuzco:** Prov. Cuzco, near Saxihuamán, *Tryon & Tryon 5361* (F, GH, US, USM). **Arequipa:** Pichu Pichu, *Stafford 676*. **Puno:** Near Puno, *Soukup 302* (F, UC).

18. ***Asplenium divaricatum*** Kunze, *Linnaea* 9: 71. 1834 (not Wallich, 1829, *nom. nud.*). TYPE: Peru, "Cerro San Christobal (*sic*), prope Casapi," *Poeppig* (diar. 1151), 1829 (holotype, LZ, destroyed; isotypes, BM!, P!, W!; photos, F, GH, UC & US of BM; F of W).

Plants epipetric, rarely terrestrial. **Stem** small to stout, erect, provided with linear or linear-lanceolate scales, these obscurely clathrate, 1–2 mm long, bicolorous, blackish with narrow but conspicuous brown bands of marginal cells. **Leaves** caespitose, 2-pinnate-pinnatisect to 3-pinnate, 5–30 cm long, 1–7 cm broad. **Petiole** 0–6 cm long, dull, reddish to grayish brown. **Lamina** thin- to firm-herbaceous, linear to elliptic, gradually reduced to apex and base. **Rachis** glabrous or with a few filiform scales, narrow-alate, lacking proliferous buds. **Pinnae** numerous, sessile, crowded to imbricate, basal pinnules overlapping the rachis. **Pinnules** of larger pinnae 6–10 pairs, bifoliate or with several pairs

of ultimate segments, segments commonly less than 2 mm long, obtuse, fertile ones nearly twice as broad as adjacent sterile ones. **Veins** simple in each ultimate segment. **Sori** solitary on the vein of each segment, at maturity usually projecting beyond segment margin. **Indusia** thin, translucent, elliptic-oblong, margins entire.

Commonly in crevices of dry rocky walls or in soil among rocks, 700–2700 m, generally along the Cordillera Central from Amazonas south to Cuzco.

Endemic to Peru.

Superficially, this resembles *A. rutaceum*, but the latter differs, among other characters, in its darker, lustrous petiole and radiant leaf apex. A distinctive feature of most leaves of *A. divaricatum* is the relative size and shape of fertile and sterile segments, which is especially evident on pinnules that are not again pinnate but merely bifoliate. The fertile segment is usually obovate, while the opposing sterile segment is often about half its width and nearly linear.

Mickel and Beitel (Mem. New York Bot. Gard. 46: 55–56. 1988) included *A. divaricatum* in their Pteridophyte Flora of Oaxaca and cited its distribution from Mexico to Peru. They maintained that this name applies to specimens from Central and South America that traditionally have been included under *A. myriophyllum* and that true *A. myriophyllum* occurs only in the West Indies. However, the Oaxaca fern they described and illustrated as *A. divaricatum* and a supposed type fragment (NY) are substantially different from actual type material (BM, P, W) of that species and from specimens of true *A. divaricatum* in Peru (cited below). References to neither the bicolorous stem scales nor the size and differences in fertile and sterile segments are seen in Mickel's description and illustration.

There is a fragmentary specimen at New York labeled simply "*Asplenium rhizophyllum* Kze., Peru, Poeppig," which is identified and filed as a type collection of *A. divaricatum*. Labels of all other type specimens (cited above) contain not only the identification as *A. divaricatum* but also the full data of type locality. *Asplenium rhizophyllum* is a synonym of *A. myriophyllum*, and indeed the "type collection" at New York matches the type of the latter well. Perhaps it is this specimen that prompted the incorrect application of the name of *A. divaricatum* to the Mexican plants. This is also typical of the understandable confusion that has long attended the circumscription of species in this

highly variable complex. See discussion of *A. haenkeanum* for further details.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla, above Leimebamba, *Hutchison & Bennett 4545* (F, GH, UC, US). Hacienda Limón, W of Balsas, *Osgood & Anderson 57* (F), *63* (F, US). **San Martín:** Trip from Pacasmayo to Moyobamba, *Stübel 1023* (B, US). **Huánuco:** Muña, *Bryan 432* (F, US). Huacachi, estación near Muña, *Macbride 3870* (F, GH, US, W). **Junín:** Prov. Tarma, near San Félix Bridge, *Ferreira 14955* (GH, USM). Prov. Tarma, SW of Huacapistana, *Tryon & Tryon 5433* (GH). **Cuzco:** Masías, high above Apurímac River, *Bües 1383* (US).

19. *Asplenium haenkeanum* (Presl) Hieron., *Hedwigia* 47: 233. 1908.

Athyrium haenkeanum Presl, Tent. pterid. 98. 1836. TYPE: Peru, near city of Huánuco, *Haenke 52* (holotype, PRC!).

Asplenium cladolepton Fée, *Mém. foug.* 7: 55. 1857. TYPE: Colombia, Prov. Ocaña, *Schlim 324* (holotype, P; isotype, L; frag., US!; photos, F & US of L).

Asplenium cladolepton var. *angustifolium* Hieron., *loc. cit.* SYNTYPES: Peru, (Loreto) prope Cuelapa (Loreto), *Stübel 1019b* (B); supra Tambo Mayo, Amazonas, *Stübel 1043* (B).

Asplenium cladolepton var. *minor* Hieron. *loc. cit.* TYPE: Peru (Loreto) prope Cuelapa, *Stübel 1019a* (B).

Plants epipetric (rarely terrestrial). **Stem** small to rather stout, erect or suberect, provided with linear or deltate-lanceolate scales, these obscurely clathrate, 1.5–3 mm long, blackish, or occasionally faintly brown-margined. **Leaves** fasciculate, 2-pinnate, 12–38 cm long, 2.2–5(–7) cm broad. **Petiole** 3–12 cm long, dull reddish or grayish brown. **Lamina** thin-herbaceous or membranaceous, linear, gradually reduced to apex and base. **Rachis** glabrous or with a few filiform scales, narrow-alate, lacking proliferous buds. **Pinnae** 20–28 pairs, approximate to subdistant, mostly patent, or proximal ones deflexed, sessile, basal pinnules overlapping the rachis. **Pinnules** of larger pinnae 3–6 pairs, shallowly to deeply bifid, fertile and sterile segments subequal, 2–3 mm long. **Veins** simple in each ultimate segment. **Sori** solitary on veins. **Indusia** thin, yellowish or greenish, margins entire.

In wet places, on or among rocks, or in crevices of rock walls, 2900–3800 m, Amazonas, La Libertad, Loreto, Huánuco, Pasco, Apurímac, Cuzco.

Colombia; Venezuela; Ecuador; Peru.

This is at the morphological center of a species complex involving *A. cristatum*, *A. myriophyllum*,

A. triphyllum, and, in a broader sense, *A. divaricatum*. These species are alike in many significant characters, although they have been separated traditionally by some variable, quantitative, features: lamina dissection and shape, degree of reduction of lamina base, degree of pinna angle, and number of pinnules.

Typical *A. triphyllum* has very long and narrow leaves with bi- or trifoliolate pinnae, in the axils of which are frequently borne proliferous buds, but not infrequently there are pinnae with an additional one or two lateral segments, whose condition thus approaches that of less robust forms of *A. haenkeanum* (3–6 pairs of pinnules). However, no proliferous buds yet have been found in the latter species. Conversely, more robust leaves of *A. haenkeanum* (narrow-elliptic, with up to 6 pairs of pinnules) resemble narrower forms of *A. myriophyllum* (7–10 pairs of pinnules). The latter is characteristically terrestrial, growing at 1400–2700 m in Peru, and *A. haenkeanum* is epipetric, at 2900 m or higher. *Asplenium cristatum* and *A. myriophyllum* have been distinguished by slight differences in scale color, pinna shape, and degree of reduction in the lamina base, which is seen under *A. cristatum*.

Some specimens of *A. myriophyllum* with unusually small ultimate segments might be confused with *A. divaricatum*, but the latter commonly can be distinguished by its conspicuously bicolorous stem scales and the difference in size and shape of the fertile and sterile segments. Obviously the entire complex in the Neotropics is badly in need of detailed study, and it is with strong reservations that its various components are separated in this flora.

La Libertad: Prov. Bolívar, Bolívar, *López & Sagástegui 3274* (GH, HUT). **Huánuco:** Chasqui, *Macbride & Featherstone 1756* (F, US, in part). **Pasco:** Huaríaca, *Bryan 168* (F). Road to Cerro de Pasco, *Gentry et al. 37486* (F, MO). **Apurímac:** Prov. Andahuaylas, Huancarama, *Vargas 8827* (UC). **Cuzco:** Ollantaytambo, *Cook & Gilbert 395* (US). Prov. Urubamba, Chincheros, *King et al. 141* (F, a variant).

20. *Asplenium cristatum* Lam., *Encycl.* 2: 310. 1786. TYPE: Locality and collector undesignated (holotype, P, *Herb. Jussieu 1276*; photo, US).

Asplenium cicutarium Sw., *Prodr.* 130. 1788. TYPE: Jamaica, *Swartz* (holotype, s!; isotype, SBT; photos, F & US of s).

Plants terrestrial, rarely epiphytic or epipetric. **Stem** stout, erect, provided with linear or deltate-lanceolate scales, these 2–3 mm long, subclathrate, gray-brown or blackish, occasionally faintly brown-margined. **Leaves** fasciculate, 2-pinnate-pinnatisect to 3-pinnate, to 60 cm long and 15 cm broad. **Petiole** 5–25 cm long, dull gray or reddish brown to blackish. **Lamina** thin-herbaceous or membranaceous, elliptic or oblong-lanceolate, gradually reduced to a pinnatifid apex, scarcely reduced at base, but occasionally with 1 or 2 proximal pairs of pinnae strongly reduced. **Rachis** glabrous or with a few, scattered, filiform scales, alate, lacking proliferous buds. **Pinnae** 15–20 pairs, approximate to crowded or imbricate, most of them patent, oblong, the margins parallel for much of their length, sessile, basal pinnules overlapping the rachis. **Pinnules** of larger pinnae 9–16 pairs, deeply pinnatisect or pinnate, ultimate segments 2.5–4 mm long, narrow-elliptic, acute. **Sori** 3–8 on a pinnule. **Indusia** thin, grayish or yellowish, margins subentire or slightly erose.

On wet forest floor, in wooded ravines, rarely on or among rocks or on bases of tree trunks, 250–2400 m, Cajamarca and Amazonas south to Ayacucho and Madre de Dios.

United States (Florida); West Indies; Mexico to the Guianas, south to Bolivia and Brazil.

With this perhaps should be included *A. myriophyllum*, which shares nearly the same range and habitat and has been distinguished by subtle differences such as shape of lamina base, pinnae, and ultimate segments. See *A. haenkeanum* for further discussion.

Cajamarca: Prov. Hualgayoc, Monte Seco, *Soukup* 3811 (F, US). **Amazonas:** Prov. Bagua, Cerro Tapur near Río Utcubamba, *Hutchison* 1480 (F, UC, US). **San Martín:** Near Tarapoto, *Spruce* 3975 (BR). **Huánuco:** Prov. Huánuco, Tingo María, *Asplund* 13201 (S). Muña, *Bryan* 424 (F). **Pasco:** Oxapampa, *Soukup* 2355 (F, GH). **Junín:** Chanchamayo Valley, *C. Schunke* 7 (F, US), 65 (F, US). **Ayacucho:** Aina [Ayna], between Huanta and Río Apurímac, *Killip & Smith* 22838 (US). **Cuzco:** Prov. La Convención, Río Apurímac below Puerto Capiro, *Davis et al.* 1293 (F, GH). **Madre de Dios:** Maldonado, *López et al.* 4588 (GH).

21. *Asplenium myriophyllum* (Sw.) Presl, Reliq. haenk. 1: 48. 1825.

Caenopteris myriophylla Sw., J. Bot. (Schrader) 1800(2): 50. 1801. TYPE: Jamaica, *Swartz* (holotype, s!; photo, F).

Plants terrestrial, rarely epipetric or epiphytic. **Stem** small to rather stout, erect or suberect, provided with linear or deltate-lanceolate scales, these obscurely clathrate, 3–4 mm long, castaneous to gray-brown or blackish, occasionally faintly brown-margined. **Leaves** fasciculate, 2-pinnate-pinnatisect or 3-pinnate, 12–35(–40) cm long, 3–7 cm broad. **Petiole** 3–15 cm long, dull reddish or grayish brown. **Lamina** thin-herbaceous or membranaceous, ovate to elliptic, gradually reduced to a pinnatifid apex, abruptly reduced at base, with 2–4(–6) proximal pairs of pinnae much shorter than central ones. **Rachis** glabrous or with a few, scattered, filiform scales, alate, lacking proliferous buds. **Pinnae** 15–28 pairs, approximate to subdistant, mostly ascending, broadest near base, tapering gradually or abruptly to apex, sessile, basal pinnules overlapping rachis. **Pinnules** of larger pinnae (6–)7–10 pairs, with one or more free ultimate segments, these 2–3 mm long, mostly obovate and obtuse to subacute. **Veins** simple in each ultimate segment. **Sori** solitary on the veins. **Indusia** thin, yellowish or greenish, margins entire.

Infrequent and widely scattered in Peru, on moist forest floor, rarely on rocks, 1400–2700 m, Cajamarca, Amazonas, Huánuco, Pasco, Junín.

United States (Florida); Greater Antilles; Mexico to Peru and Bolivia.

This is the most highly dissected of several species in a confusing complex. See further discussion under *A. haenkeanum* and *A. divaricatum*.

Cajamarca: Prov. Santa Cruz, Bosque de Monteseco, *Sagástegui et al.* 12387 (F, HUT, MO, UC). Colasay, *Woytkowski* 7014 (GH, MO, US). **Amazonas:** Prov. Bagua, Cordillera Colán SE of La Peca, *Barbour* 3896 (F, MO). **Huánuco:** Muña, *Woytkowski* 5215 (GH, MO). Prov. Leoncio Prado, km 478 on Lima-Tingo road, *Young & Sullivan* 850 (F, MO). **Pasco:** Prov. Oxapampa, 2 km from Oxapampa, *León* 496 (USM). **Junín:** Huancayo, *Soukup* (F).

22. *Asplenium delicatulum* Presl, Reliq. haenk. 1: 47, t. 7, f. 5. 1825. TYPE: Ecuador, “in Cordilleris Quitensibus,” *Haenke* (holotype, PRC!; isotype, HBG; photos, F, GH, US of HBG).

Plants epiphytic or epipetric. **Stems** very small, crowded to subdistant, borne on (usually) long-creeping, stoloniform roots. **Leaves** borne singly or in small fascicles, 2–3-pinnate, 4–7(–9) cm long. **Petiole** 1.5–4 cm long, yellow- or gray-green, with a few inconspicuous scales at the base, these dark brown, clathrate, ovate, 0.4–0.6 mm long. **Lamina**

membranaceous, deltate-ovate, reduced to a pinnatifid apex, not or scarcely reduced at base. **Rachis** glabrous, lacking proliferous buds. **Pinnæ** 5–8 pairs, approximate or subdistant, stalked, with 2–3 pinnules, these simple or again pinnate, ultimate segments 2–4 mm long, linear or narrow-oblongate, acute. **Veins** simple in each ultimate segment. **Sori** solitary on the veins. **Indusia** thin-textured, narrow-elliptic, yellowish or grayish green, entire.

In wet forests and wooded ravines, on tree trunks, branches, and fallen logs, and on wet, moss-covered rocks, 500–1500 m, San Martín, Huánuco, Pasco, Ucayali.

Colombia; Venezuela; Ecuador; Peru; Chile.

Although more than a dozen collections have been found in herbaria thus far from Peru (most of these in Huánuco), only a few specimens have been seen from Colombia and Venezuela, and apparently the species is represented to date in Ecuador only by the type. As with the closely related *A. repens*, the paucity of existing collections is likely due to the inconspicuous nature of the plant rather than to its actual rarity. See *A. repens* for further discussion.

San Martín: Prov. Mariscal Cáceres, Cerro Verde, *León* 112 (USM). Near Tarapoto, *Spruce* 4035 (BR, GH, US). **Huánuco:** Prov. Huánuco, near confluence of Río Cayumba with Huallaga, *Mexia* 8290 (F, GH, UC, US). Prov. Leoncio Prado, Dist. Rupa Rupa, 5 km S of Tingo María, *Schunke* V. 3252 (F, GH, US). Prov. Huánuco, Tingo María, *Tryon & Tryon* 5238 (F, GH, US, USM). **Pasco:** Prov. Oxapampa, Valle del Palcazú, Río Cacazú, *León* 682 (F). **Ucayali:** Prov. Coronel Portillo, Sinchono, near La Divisoria, *Aguilar* 834 (GH).

23. *Asplenium squamosum* L., Sp. pl. 1082. 1753.
TYPE: Pet. fil. 112, t. 5, f. 2, illustration based on a plant from Hispaniola.

Asplenium jamesonii Hooker, Sp. fil. 3: 184. 1860.
TYPE: Ecuador, Guayaquil, *Jameson* (holotype, K; isotype, BM; frag., NY!; photo, US of BM).

Plants terrestrial. **Stem** stout, creeping or decumbent, provided with broad, flaccid, light brown scales, these 10–20 mm long, 3–6 mm broad, finely clathrate, often remotely fimbriate. **Leaves** subdistant, 2-pinnate or 2-pinnate-pinnatifid, 40–100 cm long, 15–50 cm broad. **Petiole** to 40 cm long, dull, light or grayish brown. **Lamina** firm-herbaceous to chartaceous, subdeltate, gradually reduced to a pinnatifid apex, not reduced at base, most axes and veins sparsely to moderately pro-

vided with minute, brown, appressed, 2–3-celled, articulate trichomes. **Rachis** light or gray-brown, glabrous, with a few, scattered, broad scales, non-alate, narrowly alate near apex, lacking proliferous buds. **Pinnæ** 8–16 pairs, approximate, ascending, clearly stalked, deltate or oblong-deltate. **Pinnules** 2–9 cm long, ovate-lanceolate to subtrapeziform acute or subacute, cuneate at base, crenate-dentate or deeply lobed. **Veins** several-forked, borne at acute angles. **Sori** borne in a single line along each side of costule. **Indusia** thin, often scarious, margins entire to erose.

In forests, thickets, or wooded ravines, in wet or rocky soil, 2100–3600 (–3900) m, San Martín, Huánuco, Ayacucho, Apurímac, Cuzco.

Hispaniola; Costa Rica; Colombia and Venezuela to Bolivia and Brazil.

This species is distinguished by its huge leaves and the very large, nearly trapeziform, ultimate segments. With it probably should be included *A. tucumanense* Hieron. of Argentina.

San Martín: Prov. Mariscal Cáceres, Río Abiseo, *Young* 4168 (USM). **Huánuco:** Mito, *Bryan* 379 (F). Muña, *Bryan* 627 (F). Tambo de Vaca, *Macbride* 4464 (F, US). **Ayacucho:** Prov. La Mar, between El Tambo and Ayna, *Plowman & Davis* 4681 (GH, USM). **Apurímac:** Prov. Abancay, *Sánchez* 244 (USM). **Cuzco:** Prov. Paucartambo, Pillahuata, *Aldave* 5024 (HUT). Calca, *Vargas* 15645 (GH).

24. *Asplenium cuspidatum* Lam., Encycl. 2: 310. 1786. TYPE: Peru, *Jussieu* (holotype, P, *Herb. Jussieu*, photo, US; isotype, P, *Herb. Lamarck*; photo, US).

Plants epiphytic or terrestrial, rarely epipetric. **Stem** stout, erect, provided with lanceolate to ovate, orange to gray-brown scales, these 2–4 mm long 0.5–0.8 mm broad, acute, narrowly clathrate. **Leaves** caespitose, 2-pinnate (at least as to basal pinnæ) to nearly 4-pinnate, 10–70 cm long, 2–12 (–15) cm broad. **Petiole** dull or sublustrous, green or gray to reddish brown or blackish. **Lamina** firm-herbaceous to chartaceous, lanceolate to ovate or subdeltate, tapered to a pinnatifid or serrate, often caudate, apex, not reduced at base, commonly glabrous. **Rachis** glabrous, but with a few, minute, filiform scales, nonalate, or narrowly so distally, lacking proliferous buds. **Pinnæ** 6 to many pairs, approximate to subdistant, most of them ascending, short-stalked, ovate to linear-lanceolate. **Pinnules** 0.5–2 cm long, lanceolate to ovate, acute or subacute, subentire to nearly 3-pinnate, at least

the basal ones of proximal pinnae obviously stalked. **Veins** forked to pinnately branched. **Sori** elliptic. **Indusia** relatively thick and fleshy, narrow, grayish or whitish, subentire.

This and *A. auritum* are components of a highly varied species complex. Pending monographic study they are separated arbitrarily here as a matter of convenience (see *A. auritum* for detailed

discussion). In Central America and northern South America, *A. cuspidatum* is very common, but south of Ecuador it is encountered much less frequently. Two varieties are provisionally recognized in Peru, and var. *tripinnatum* is included in the following key, as it is to be expected here.

The species occurs in the West Indies, from Mexico to Panama, and from Colombia and Venezuela south to Bolivia and Brazil.

- a. Proximal pinnae 1-pinnate (at least near their base), the pinnules deeply serrate or a few with basal acroscopic lobes 24a. var. **cuspidatum**
- a. Proximal pinnae 1-pinnate-pinnatifid to nearly 3-pinnate, most of the pinnules deeply pinnatifid or more b
- b. Proximal pinnae 1-pinnate-pinnatifid to nearly 2-pinnate, the pinnules deeply pinnatifid, some tertiary segments incised to the costule, but never freely stalked 24b. var. **tripinnatum**
- b. Proximal pinnae 2-pinnate to nearly 3-pinnate, tertiary segments commonly stalked 24c. var. **foeniculaceum**

24a. *Asplenium cuspidatum* var. *cuspidatum*.

In forests, on wet slopes, rarely on mossy rocks or on tree trunks, 1500–3100 m, Cajamarca, Amazonas, La Libertad, San Martín, Cuzco.

Mexico to Panama; Colombia and Venezuela to Bolivia and Brazil.

Plants with less dissected pinnae merge with, and are often identified as, *A. auritum*.

Cajamarca: Prov. Santa Cruz, Bosque de Montesco, *Sagástegui et al.* 12382 (F, HUT, MO, UC). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla, 45 km above Balsas, *Hutchison & Wright* 5807 (GH, UC). **La Libertad:** Prov. Bolívar, between Unámen and Bolívar, *López & Sagástegui* 3331 (GH). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & León* 4945 (HUT), 4994 (HUT). **Cuzco:** Prov. Urubamba, Machu Picchu, above Río Mandor, *Peyton & Peyton* 1286 (MO). Prov. La Convención, Huayopata, 10 km SW of Incatambo, *Peyton & King* 1428 (MO).

24b. *Asplenium cuspidatum* var. *tripinnatum* (Fourn.) Morton & Lell., Mem. New York Bot. Gard. 15: 29. 1966.

Asplenium fragrans Sw., Prodr. 180. 1788. TYPE: Jamaica, *Swartz* (holotype, s; isotype, UPS; photo, US of s).

Asplenium auritum Sw. var. *tripinnatum* Fourn., Mexic. pl. 1: 107. 1872. TYPE: Based on *A. fragrans* Sw.

Not yet reported from Peru, but to be expected.

Greater Antilles, except Puerto Rico; Mexico to Panama; Colombia and Venezuela to Bolivia and Brazil.

24c. *Asplenium cuspidatum* var. *foeniculaceum* (HBK.) Morton & Lell., Mem. New York Bot. Gard. 15: 29. 1966.

Asplenium foeniculaceum HBK., Nov. gen. sp. 1: 15. 1815. TYPE: “Novae Andalusiae,” *Humboldt & Bonpland* (holotype, P; isotype, B, Herb. Willd. 19860; photos, US of P, F & GH of B).

Asplenium abrotanoides Presl, Reliq. haenk. 1: 47, t. 8, f. 2. 1825. TYPE: Peru, Huánuco, *Haenke* (holotype, PRC!; frag., NY!).

Asplenium cuspidatum var. *abrotanoides* (Presl) Morton & Lell., Mem. New York Bot. Gard. 15: 29. 1966.

In wet forests and wooded canyons, in humus, on mossy logs, sometimes in rocky soil or on tree trunks, 2000–3950 m, Piura, Huánuco, Huancaavelica, Apurímac, Cuzco, Puno.

Mexico to Panama; Colombia and Venezuela to Bolivia and Brazil.

Of the two varieties reported from Peru, var. *cuspidatum* usually is found (with few exceptions) in the northwest and var. *foeniculaceum* in the central or (mostly) southern portions. With the absence, thus far, of the intermediate var. *tripinnatum*, the two others are easily separated, both geographically and morphologically.

Piura: Prov. Ayabaca, near Ayabaca, *Sagástegui & Cabanidas* 8700 (MO). **Huánuco:** Tambo de Vaca, *Bryan* 647 (F, GH), *Macbride* 4459 (F, US). **Huancaavelica:** Prov. Tayacaja, Ampurco, between Salcabamba and Surcubamba, *Tovar* 3767 (GH). **Apurímac:** Prov. Abancay, forests of Ampay, *Vargas* 1066 (GH, US). **Cuzco:** Prov. Paurtambo, Dist. Marcacocha, near Achirani, *Vargas* 11140

(F, GH, UC, US). **Puno:** Prov. Carabaya, between Ayapata and Kahualloyoc, *Vargas 10770* (GH).

25. ***Asplenium repandulum*** Kunze, *Linnaea* 9: 65. 1834. TYPE: Peru, Huánuco, "Pampayaco" [Pampayacu], *Poeppig* in July 1829 (holotype, LZ, destroyed; frag., NY!).

Plants epiphytic, at least in Peru. **Stem** short-to long-creeping, scales lacking or rare and small (less than 1 mm long). **Leaves** 1-pinnate, subdistant to remote, 20–40 cm long, 6–12 cm broad. **Petiole** 3–15 cm long, fleshy, dull reddish or greenish brown, naked or with a few small scales at base. **Lamina** thin-herbaceous or membranaceous, oblong-lanceolate to ovate, not or only slightly reduced at base, narrowing abruptly to a subconform apical segment, this often with a broad, basal lobe. **Rachis** scarcely to broadly alate, lacking proliferous buds. **Pinnae** 10–20 pairs, approximate to subdistant, sessile or short-stalked, apex acute to attenuate (rarely obtuse), strongly inequilateral at base, narrowly cuneate or excavate basiscopically, truncate and often auriculate acroscopically, margins crenate to serrate. **Veins** 1–2-forked, ascending from the costa at 30–40° angles. **Sori** mostly medial. **Indusia** linear, opaque, greenish or brown, subentire.

In forests, on tree trunks, 1250–2000 m, Amazonas to Junín, Madre de Dios.

Southern Mexico to Panama; Venezuela and Colombia to Brazil and Bolivia.

With this perhaps should be included *A. obtusifolium* L. of northern South America and the West Indies, which supposedly differs from *A. repandulum* in having fewer pinnae with obtuse apices and a basal lobe incised nearly to the costa. Although *A. repandulum* is often epipetric or terrestrial in Mexico and Central America, most collectors report it as epiphytic in Peru and Ecuador.

Amazonas: East of La Peca in Serranía de Bagua, *Gentry et al. 23073* (MO, UC). **Huánuco:** Fundo Chela, Río "Chin" (Chinchao?), *Aguilar 911* (USM). Prov. Leoncio Prado, Dist. Hermilio Vladizán, La Divisoria, *Plowman & Schunke 7363* (F, GH). **Pasco:** Prov. Oxapampa, Gran Pajónal, *D. Smith 5168* (F, MO). **Junín:** Prov. Tarma, Chanchamayo Valley, above La Merced, *Hutchison 1196* (F, GH, UC, US). Chanchamayo Valley, *C. Schunke 155* (F, US). **Madre de Dios:** Cocha Cashu, between Panagua and Tayakome, *Foster et al. 3449* (F).

26. ***Asplenium vomeriforme*** Hooker, *Sp. fil.* 3: 109, t. 162. 1860. TYPE: Peru, *Mathews* in 1835

(K!). (*Mathews 1851* was cited by Hooker in the protologue.)

Asplenium mathewsii Moore, *Index fil.* 145. 1857. *Nom. nud.*

Plants epiphytic or terrestrial. **Stem** decumbent, or rarely very short-creeping, provided with golden-tomentose roots and gray-brown scales, these narrowly clathrate, linear-lanceolate, attenuate, 4–7 mm long, often ciliate toward base. **Leaves** crowded, long-petiolate, usually pendent, 1-pinnate, to 90 cm long and 25 cm broad. **Petiole** 15–40 cm long, dull, dark brown to yellow-brown, glabrous. **Lamina** carnose or chartaceous, abruptly terminating in a subconform apical segment, or this often with a basal lobe or auricle, not or scarcely reduced at base, rachis nonalate. **Pinnae** 6–14 pairs, larger ones 9–13 cm long, 2.5–4 cm broad, patent, short-stalked, most of them narrowly to broadly deltate, the margins entire or inconspicuously crenulate, conspicuously inequilateral at base, acroscopically truncate to cordate or auriculate, basiscopically rounded to broadly cuneate, but proximal ones mostly truncate. **Veins** once or twice dichotomously forked, indistinct or obscure. **Indusia** firm, entire, inrolled at maturity.

In primary and secondary forests, pendent from tree trunks and branches, or on the forest floor, 1200–1800 m, Pasco and Junín.

Endemic.

This is very closely related to *A. salicifolium* and may be merely a very robust, local variant. Principal differences are size, shape and margins of pinnae.

Pasco: Prov. Oxapampa, 2 km from Oxapampa, *León et al. 500* (F, UC, US, USM). Prov. Oxapampa, in coffee plantation near Villa Rica, *van der Werff et al. 8278* (F, MO, UC). **Junín:** Chanchamayo Valley, *C. Schunke 695* (F), *696* (F, US). Prov. Satipo, Gran Pajónal, south of Chequitavo, *D. Smith 5151* (F, MO, UC).

27. ***Asplenium juglandifolium*** Lam., *Encycl.* 2: 307. 1786. TYPE: "Antilles" (probably Puerto Rico or Hispaniola), collector undesignated (holotype, P, *Herb. Jussieu 1283A & B*; photos, F & US of 1283A).

Asplenium integerrimum Sprengel, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 10: 231. 1821. TYPE: Puerto Rico, *Bertero* (holotype, B; isotypes, L, P; photos, US of B, F, & US of P). *Asplenium falcinellum* Maxon, *Contr. U.S. Natl. Herb.*

13: 14. 1909. TYPE: Guatemala, Cubilguitz, *Tuerckheim 1910* (holotype, us!).

Plants epiphytic (rarely terrestrial outside Peru). **Stem** decumbent (rarely very short-creeping outside Peru), provided with medium or dark brown scales, these narrowly clathrate, mostly filiform, 3–10 mm long, 0.1–0.3(–0.4) mm broad. **Leaves** crowded, long-petiolate, 1-pinnate (juvenile ones rarely simple), to 80 cm long and 25 cm broad. **Petiole** 10–30 cm long, dull reddish or greenish brown, with a few linear scales at very base. **Lamina** firm-herbaceous to chartaceous, abruptly terminating in a conform apical segment, not reduced at base, scarcely or moderately provided abaxially with minute (0.1–0.2 mm), appressed, trichomes, these often gland-tipped, rachis very narrowly alate (if at all) near the apex. **Pinnae** (0–)2–12 pairs, larger ones 7–20 cm long, 1.2–2.6(–4) cm broad, ascending, short-stalked, apices commonly attenuate, subequilateral at the cunate base, margins entire. **Veins** 1–2-forked, indistinct. **Indusia** linear, firm and rather thick-textured, entire.

On tree trunks in wet forests, 100–1500 m, Amazonas and Loreto to Cuzco.

Southern Mexico to Panama; Greater Antilles; Trinidad; Colombia to Surinam, south to Bolivia and Brazil.

This species is quite variable in number, size, and shape of pinnae and in length of stem scales, and these differences have encouraged earlier separation into several species and varieties. At one extreme is *A. integerrimum* of the Greater Antilles, with 2–5 pairs of pinnae well over 2 cm broad, their bases quite inequilateral, and truncate to broadly rounded. *Asplenium falcinellum* of Central America typically has 6–12 pairs of pinnae 1.2–1.8 cm broad, their bases more narrowly and more equally cuneate. Pinnae in the type specimen of *A. juglandifolium* more closely resemble those of the former species. Length of stem scales frequently corresponds with pinna characters in that those of *A. falcinellum* tend to be less than 5 mm long and those of *A. juglandifolium* and *A. integerrimum* 6–10 mm long. However, throughout South America, especially in Ecuador and Peru, a number of specimens with numerous and narrower pinnae have much longer scales, and in other specimens the converse is true, which renders the separation of these taxa untenable when examined throughout the entire range of distribution. Also included under *A. juglandifolium* should be *A. kapplerianum* Kunze of Surinam and probably *A. neogranatense* Fée of Colombia.

Amazonas: Prov. Bagua, Dist. Cenepa, *Tillett 672-67* (GH). **San Martín:** Zepelacio, near Moyobamba, *Klug 3430* (F, GH, MO, US). Prov. Mariscal Cáceres, Tocache Nuevo, *Schunke V. 6948* (F, GH, MO). **Loreto:** Río Mamon near Río Nanay, *Croat 19950* (GH, MO, UC). Río Mazán, Salinas, *J. Schunke 375* (F, GH, UC, US). **Huánuco:** Above Río Huallaga at Tingo María, *Croat 21033* (MO, US). **Pasco** (as Junín): Puerto Bermúdez, *Killip & Smith 26679* (US); Prov. Oxapampa, Cordillera San Matías, *León 322* (F, USM). **Cuzco:** Prov. Paucartambo, Callanga, *Woytkowski 392* (GH).

28. *Asplenium tuerckheimii* Maxon, Contr. U.S. Natl. Herb. 13: 15. 1909. TYPE: Guatemala, Baja Verapaz, Panzál, *Tuerckheim II-1677* (us!).

Plants terrestrial. **Stem** erect or decumbent, provided at apex with blackish brown, clathrate scales, these ovate, 1–2.5 mm long, often somewhat vaulted. **Leaves** crowded or fasciculate, to 50 cm long and 15 cm broad, long-petiolate, 1-pinnate. **Petiole** to 25 cm long, dull grayish to reddish brown, glabrous. **Lamina** firm-herbaceous, abruptly terminating in a conform apical segment (this segment sometimes obsolete), not reduced at base, glabrous except for scattered, minute (0.1–0.2 mm), appressed, sometimes glandular trichomes, rachis narrowly alate. **Pinnae** typically 3–6 pairs, to 10 cm long and 1.8 cm broad, alternate, at least proximal ones stalked, not or rarely adnate, narrowly and subequally cuneate at base, acute to attenuate at apex, margins broadly crenate-serrate. **Veins** 1–2-forked, not distinct. **Indusia** thin, yellowish brown, entire.

On the floor of deep forests, 600–1500 m, Junín and Cuzco.

Southern Mexico; Guatemala; Peru.

The few collections made in Peru constitute a wide disjunction in range for this species, heretofore known only from southern Mexico and Guatemala. It is sometimes confused with *A. abscissum*, or with specimens of *A. juglandifolium* with narrow pinnae. The latter species has pinna bases somewhat to strongly inequilateral, and long, filiform stem scales, whereas pinnae in *A. tuerckheimii* are equilaterally and narrowly cuneate, and stem scales are minute, ovate, and often somewhat vaulted. *Asplenium abscissum* is much more closely related, for it has identical stem scales. The latter is usually distinguished by its pinnatifid or non-conform apical segments and by strongly inequilateral pinna bases.

Junín: Chanchamayo Valley, *C. Schunke 88* (F, US),

1023 (F). Cuzco: Prov. La Convención, Río Apurímac, below Puerto Capiro, *Davis et al.* 1311 (F, GH, UC).

29. *Asplenium tricholepis* Rosenst., Repert. Spec. Nov. Regni Veg. 12: 468. 1913. TYPE: Bolivia, Yungas, Polo-Polo, near Coroico, *Buch-tien* 3330 (holotype, s!; isotype, us!).

Asplenium rusbyanum Domin, Pterid. Dominica 171, t. 29, f. 2. 1929. TYPE: Bolivia, Yungas, *Rusby* 383 (holotype, presumably K; isotypes, F!, GH!, us!).

Plants epiphytic. **Stem** stout, erect or decumbent, provided with orange to reddish brown, clathrate, scales, these lanceolate to ovate, flat, 5–15 mm long, 1–2 mm broad, margins (especially at base) often bearing long, tortuous cilia. **Leaves** few, crowded, to 60 cm long and 20 cm broad, long-petiolate, 1-pinnate. **Petiole** to 30 cm long, dull, gray-green to purplish brown, glabrous. **Lamina** firm-herbaceous to subcarnose, abruptly terminating in a conform apical segment, not reduced at base, glabrous, rachis not or scarcely alate. **Pinnæ** (1)–2–5 pairs, to 25 cm long and 4 cm broad, alternate, sessile or subsessile, not or rarely adnate, narrowly and subequilaterally cuneate at base, apices obtuse or acute, occasionally attenuate, margins entire. **Veins** 1–2(–3)-forked, distinct or indistinct. **Indusia** thick, inrolled at maturity, entire.

On tree trunks in dense, wet forests, 800–2100 m, Amazonas to Cuzco.

Ecuador; Peru; Bolivia.

The long-ciliate stem scales may be helpful in distinguishing this species, but they do occur, perhaps less frequently, in *A. davisii*, *A. juglandifolium*, and *A. salicifolium* and its relatives. However the cilia often go unobserved, either because they are readily broken off or are actually lacking.

Asplenium tricholepis has been confused with *A. oligophyllum* Kaulf. (syn. *A. escragnollei* Fée) of Venezuela and Brazil, which is very similar; however, the latter has crenulate pinna margins, and blackish, filiform scales along the costae abaxially.

Amazonas: Prov. Bagua, E of La Peca, *Barbour* 2522 (MO), 2576A (MO). **Huánuco:** Prov. Huánuco, Tulumayo, near Tingo María, *Ferreya* 2151 (GH). **Pasco** (as Junín): Pichis Trail, Yapas, *Killip & Smith* 25560A (US). **Junín:** Schunke Hacienda above San Ramón, *Killip & Smith* 24837 (F, US). **Cuzco:** Prov. La Convención, NE of Hacienda Luisiana, *Dudley* 10398 (GH). Prov. La Convención, Tinkuri, *Vargas* 5453 (UC).

30. *Asplenium davisii* Stolze, sp. nov.

Plantae terrestres. Caulis erecta vel decumbens, paleis brunneolis, clathratis, ovato-lanceolatis, 5–10 mm longis, 1.5 mm latis. Folium 50–100 cm longum, 16–28 cm latum. Petiolus 25–60 cm longus, obscurus, flavidus vel purpurascens. Lamina 1-pinnata, segmento apicali conformi, in pagina abaxiali trichomatibus minutis, adpressis, brunneis, glandulosibus. Pinnæ 3–7 jugae, 14–24 cm longae, 3–4 cm latae, lanceolatae, attenuatae, ad basin cuneatae et subequilaterale, marginibus crenato-serratis.

Plants terrestrial. **Stem** stout, erect or decumbent, provided with brown or gray-brown, clathrate scales, these ovate-lanceolate, flat, 5–10 mm long, and about 1.5 mm broad, the margins sometimes ciliate. **Leaves** few, crowded, 50–100 cm long, 16–28 cm broad, long-petiolate, 1-pinnate. **Petiole** 25–60 cm long, dull, yellowish to purplish brown, glabrous. **Lamina** chartaceous, abruptly terminating in a conform apical segment, not reduced at base, amply to moderately provided abaxially with minute (0.1–0.2 mm) appressed, dark brown, pluricellular, often gland-tipped trichomes, rachis nonalate. **Pinnæ** (2)–3–7 pairs, larger ones 14–24 cm long and 3–4 cm broad, alternate, stalked, lanceolate, attenuate, broadly to narrowly cuneate and subequilateral at base, margins crenulate to crenate-serrate. **Veins** 1–2-forked, usually rather distinct. **Indusia** linear, 1.5–2.5 cm long, greenish or yellowish, thin, often inrolled at maturity.

TYPE—Peru, Cuzco, Prov. La Convención, Río Apurímac, above Boca del Tigre rapids, *Davis et al.* 1292 (holotype, F!; isotypes, GH!, UC!).

Endemic. Terrestrial in wet forests, 100–1600 m, Amazonas and Loreto south to Cuzco and Madre de Dios.

This species has been most frequently identified as *A. oligophyllum* Kaulf. (syn. *A. escragnollei* Fée) of northern South America and Brazil, which differs most significantly in the blackish, filiform, clathrate scales along the costa. Presence of these scales indicates a relationship with the simple-leaved *A. serratum* and *A. angustum*. *Asplenium oligophyllum* is further distinguished from *A. davisii* by the absence of minute, appressed trichomes on the abaxial laminar surface.

Asplenium davisii is probably more closely related to *A. canelense* Rosenst., a rare species from Colombia and Ecuador (type: Ecuador, *Spruce*, Herb. Bonaparte no. 10010, P!). That species differs by its much more numerous (12–14 pairs) pinnæ and the absence of glandular trichomes. Another similar species from Ecuador is *A. virens* Presl (syn. *A. flavidum* Sodiro), which differs from

A. davisii by its smaller (less than 40 cm) leaves, its much smaller (3–5 mm) stem scales, more deeply serrate, merely obtuse to acute, pinnae, and the absence of laminar trichomes.

Amazonas: Prov. Bagua, Cerro Tapur on Río Utcubamba, *Hutchison* 1485 (F, UC, US). **Loreto:** Puerto Arturo, lower Río Huallaga below Yurimaguas, *Killip & Smith* 27773 (US). **Huánuco:** Prov. Leoncio Prado, Dist. Hermilio Valdizán, La Divisoria *Plowman & Schunke* 7377 (F). **Junín:** Chanchamayo Valley, *C. Schunke* 5 (F, US), 75 (F, US), 452 (F, US). **Cuzco:** Prov. Paucartambo, Koshipata-Pilcopata, *Vargas* 11290 (GH). **Madre de Dios:** Prov. Manú, Atalaya, *Foster & Wachter* 7462 (F, MO).

31. *Asplenium laetum* Sw., Syn. fil. 79: 271. 1806. TYPE: "Habitat in India occidentale," Swartz (holotype, s).

Asplenium virens Desv., Mém. Soc. Linn. Paris 6: 273. 1827, not Presl, 1825. TYPE: "Habitat in America," collector undesignated (holotype, p, *Herb. Desv.*; photo, US).

Plants terrestrial. **Stem** short-creeping (sometimes not obviously so), provided with linear scales, these clathrate, 1–3 mm long, dark brown or blackish. **Leaves** 1-pinnate, crowded, to 40 cm long, 4–8 cm broad. **Petiole** 6–18 cm long, dull grayish or greenish to lustrous and reddish brown or atropurpureous, not alate, sparsely to amply scaly. **Lamina** thin-herbaceous, oblong-lanceolate, gradually diminishing to a pinnatifid, often subcaudate, apex, not or scarcely reduced at base. **Rachis** essentially glabrous, scarcely alate distally, lacking proliferous buds. **Pinnae** 15–24 pairs, larger ones 2.5–4.5 cm long, subsessile or short-stalked, most of them strongly inequilateral for nearly half their length, truncate acroscopically, narrow-cuneate or excavate basiscopically, obtuse to acute at apex, margins bicrenate or biserrate acroscopically, subentire basiscopically. **Veins** 1–2-forked. **Sori** spreading at 30–40° from costa, not or rarely diplazoid. **Indusia** thin, pale green or yellowish, linear, subentire.

On floor of forests, on rocky slopes, or on mossy rocks or in soil pockets of rocky cliffs, 200–900 (–1600) m, Amazonas south to Cuzco.

Southern Mexico to Panama; West Indies; Colombia to Surinam, south to Argentina and Paraguay.

This is one of a few species of *Asplenium* with the petiole varying from light to dark in color and from dull to lustrous, the variation observable on the same plant. The stem is very short-creeping,

with petioles quite crowded, so on some specimens it may appear to be decumbent. Besides the differences cited in the key, it differs from *A. delitescens* and *A. melanopus* in another subtle character. The typical lamina in *A. laetum* becomes very gradually pinnatifid to a nearly caudate apex; i.e., each pair of distal segments becomes slightly shorter than the adjacent pair, the lamina finally terminating in a subcaudate tip. In the other two species, the distal segments are rather abruptly reduced, the lamina commonly terminating in a nonconform apical segment.

Amazonas: Bagua, 12 km S of La Peca, *Barbour* 2500 (F). **San Martín:** Juan Jui, Alto Río Huallaga, *Klug* 4253 (F, GH, UC, US). **Huánuco:** Prov. Leoncio Prado, Dist. Rupa Rupa, 5 km S of Tingo María, *J. Schunke* V. 3261 (F, GH). Prov. Huánuco, Tingo María, *Tryon & Tryon* 5228 (F, GH, US, USM). **Pasco:** Prov. Oxapampa, Río El Tunqui, *D. Smith et al.* 1710 (F, MO). **Junín:** La Merced, Chanchamayo, *C. Schunke* 20 (A). **Cuzco:** Prov. La Convención, below Rosalina, *Vargas* 12293 (GH).

32. *Asplenium melanopus* Sodiro, Crypt. vasc. Quit. 189. 1893. TYPE: Ecuador, Chimborazo, Pallatanga Valley near Chimbo Bridge, *Sodiro* (holotype, QCA?).

Diplazium melanopus (Sodiro) Hieron., Bot. Jahrb. Syst. 34: 456. 1904.

Plants terrestrial or epipetric. **Stem** short-creeping, provided with linear to lanceolate scales, these clathrate, 0.5–1.5 mm long, dark brown. **Leaves** 1-pinnate, approximate to crowded, 28–64 cm long, 10–18 cm broad. **Petiole** 12–32 cm long, dark reddish brown to purplish, dull, or sometimes lustrous, nonalate, sparsely scaly as on the stem. **Lamina** firm-herbaceous to membranaceous, deltate or ovate-deltate, rather abruptly reduced to a pinnatifid or nonconform apical segment, not or scarcely reduced at base. **Rachis** essentially glabrous, not or scarcely alate, lacking proliferous buds. **Pinnae** 7–11 pairs, larger ones 6–12 cm long and 1.4–4 cm broad, short-stalked, equilateral except at base, truncate acroscopically, abruptly cuneate or excavate basiscopically, acute to attenuate at apex, both margins lobed to pinnatifid, the tip of each lobe or segment with a few rounded teeth. **Veins** distinct, several times forked. **Sori** borne on the vein branches, often back-to-back (diplazoid). **Indusia** thin, yellow to reddish brown, linear, subentire.

In forests, in soil or among rocks, sometimes on

rocky outcrops, 250–1700 m, Amazonas, Loreto, Junín, Madre de Dios.

Colombia; Ecuador; Peru.

This and *A. delitescens* have been included earlier in *Diplazium* because of the frequent occurrence of back-to-back sori. However, each has the principal diagnostic characters of *Asplenium*: obviously clathrate scales, single-rowed cells in sporangia stalks, annular cells of sporangia 20 or more, spores with folded perispore. The two species differ from each other chiefly in the degree of pinna lobing and perhaps should be separated merely at an infraspecific level.

Asplenium purpurascens Mett. of Ecuador, and *A. melanopus* may also be synonymous; however, the type of the former has not been examined during this study. The name of *A. purpurascens* would have priority.

Amazonas: Prov. Bagua, E of La Peca, *Barbour 2500* (F, a depauperate specimen). **Loreto:** Right bank of Río Santiago, above Pongo de Manseriche (Amazonas), *Mexia 6223* (GH, UC, US). **Junín:** Colonia Perené, *Killip & Smith 24924* (F, US). **Madre de Dios:** Prov. Tambopata, Albergue Cuzco Amazónico, *León 866* (USM).

33. *Asplenium delitescens* (Maxon) Gómez, Brenesia 8: 52. 1976.

Diplazium delitescens Maxon, contr. U.S. Natl. Herb. 10: 497. 1908. TYPE: Cuba, Oriente, vicinity of San Luis, *Pollard & Palmer 348* (holotype, us!).

Plants terrestrial, occasionally epipetric or epiphytic. **Stem** short-creeping, provided with linear or lanceolate, attenuate scales, these clathrate, 1–2 mm long, dark brown to blackish. **Leaves** 1-pinnate, approximate to crowded, 30–54 cm long, 12–24 cm broad. **Petiole** 14–25 cm long, dark reddish brown to yellowish brown or greenish, dull to sublustrous, nonalate, sparsely scaly. **Lamina** thin- to firm-herbaceous, deltate or oblong-deltate, nonalate, sparsely scaly. **Lamina** thin- to firm-herbaceous, deltate or oblong-deltate, gradually or abruptly reduced to a nonconform, sometimes attenuate, apical segment, not or scarcely reduced at base. **Rachis** glabrous, or with a few filiform scales, marginate or inconspicuously alate distally, lacking proliferous buds. **Pinnæ** 6–10 pairs, larger ones 6–14 cm long and 1.5–2 cm broad, sessile, or proximal ones short-stalked, equilateral except at base, there truncate (and sometimes auriculate) acroscopically, narrowly cuneate to excavate basiscopically, acute to attenuate at apex, margins serrate to deeply crenulate acroscopically, serrate or

subentire basiscopically. **Veins** distinct or indistinct, 1–2-forked. **Sori** (some of them) diplazioid. **Indusia** yellow to light brown, linear, subentire.

In forests, on tree trunks, on clay banks, or on the forest floor, occasionally on rocky cliffs, 135–750 m, Loreto, Huánuco, Madre de Dios.

Southern Mexico to Panama; Cuba; Colombia; Ecuador; Peru.

This is probably only a less-dissected form of *A. melanopus*, under which see further discussion.

Loreto: Yurimaguas, lower Río Huallaga, *Killip & Smith 29078* (US). **Huánuco:** Tingo María, *Moran 3676* (MO, UC, USM). Prov. Pachitea, Dist. Puerto Inca, Bosque Nacional de Iparia, *J. Schunke V. 2967* (F, GH, US). **Madre de Dios:** Prov. Manú, Parque Nacional Manú, Pakitsa Station, *Foster & Baldeón 12806* (F).

34. *Asplenium achilleifolium* (Mart. & Gal.) Liebm., Kongel. Danske Vidensk. Selsk. Skr., Naturv. Afd. V, 1: 249 (*seors.* 97). 1849, not (Lam.) C. Chr. 1905.

Caenopteris achilleifolia Mart. & Gal., Nouv. Mém. Acad. Roy. Sci. Bruxelles 15: 63. 1842. SYN-TYPES: Mexico, Veracruz, vicinity of Mirador, *Galeotti 6279* (BR), 6293 (BR).

Athyrium achilleifolium (Mart. & Gal.) Fée (Mém. foug. 5) Gen. fil.: 186. 1852.

Plants terrestrial. **Stem** erect or decumbent, amply provided with obscurely clathrate, ovate or lanceolate scales, these to 5 mm long and 3 mm broad, obtuse or acute, light to dark brown. **Leaves** 1-pinnate-pinnatisect or nearly 2-pinnate, caespitose, 0.3–1.0 m long, 9–30 cm broad. **Petiole** somewhat shorter than the lamina, dull greenish or grayish brown, sparsely scaly, basal scales broad, the rest filiform. **Lamina** firm-herbaceous, ovate or lanceolate, tapering to an attenuate, pinnatifid apex, not or slightly reduced at base. **Rachis** broadly alate, lacking proliferous buds, sparsely filiform-scaly. **Pinnæ** numerous, 5–15 cm long, crowded to subdistant, subsessile, truncate and narrowly decurrent at base, cut nearly to costa into 7–16 pairs of segments, these subentire to crenate or serrate. **Veins** 1–several-forked, diverging from the midrib at a wide angle. **Indusia** thin, elliptic, yellowish to whitish.

Thus far known in Peru from one collection, in wet forest, 2000 m, Amazonas.

Southern Mexico to Nicaragua; Ecuador?; Peru.

The collection cited below apparently is a depauperate form of *A. achilleifolium*. It matches

typical plants in Central America except that the leaves and pinnae are significantly shorter. Stolze (1986, p. 76) cited a single collection from Ecuador as another possible variant of this species. In any case, this represents a strikingly disjunct distribution.

Amazonas: Prov. Bagua, 20 km E of La Peca, *Barbour* 2759 (F, MO, UC).

35. *Asplenium projectum* Kunze, *Linnaea* 9: 68. 1835. TYPE: Peru, "Pampayaco, in rupibus calidioribus" (Dept. Huánuco, Pampayacu), *Poeppig* (*diar.* 1156), Jul. 1829 (holotype, B!; isotypes, B!, P; photos, GH & UC of P).

Plants epipetric. **Stem** very small, erect, provided with linear-lanceolate scales, these 0.5–1 mm long, clathrate, blackish, sublustrous. **Leaves** fasciculate, to 7 cm long and 0.7 cm broad. **Petiole** 1–3 mm long, dull greenish or grayish brown, rarely blackish, marginate or narrowly alate. **Lamina** thin-herbaceous, linear, gradually tapering to a pinnatifid or flagelliform apex, somewhat reduced at base. **Rachis** dark brown or atropurpureous, moderately provided with minute, glandular trichomes, narrow-alate, often bearing a proliferous bud at apex or in a pinna axil. **Pinnae** 12–18 pairs, 2–3 mm long, subopposite, with short, blackish stalks, rotund to obovate, or shallowly and broadly bi- or trilobate, costa lacking. **Veins** distinct, black, simple or 2–3-forked in each pinna. **Sori** 1–2 on a pinna. **Indusia** thin, yellow-green, oblong-elliptic.

In rock crevices, and among rocks, about 2500 m, Amazonas, Huánuco.

Endemic.

This rare species is one of the smallest of the genus in Peru and is closely related to *A. peruvianum*, *A. gilliesii*, and *A. triphyllum*. The tiny, roundish pinnae and the black color of the stalks that continues onto the veins set it apart from its affiliates. The *López* collection is the first for over a century, but this is not surprising, as the fern is so tiny and inconspicuous.

The *Poeppig* collection cited below is incorrectly labeled as a type at Vienna.

Amazonas: Prov. Chachapoyas, Pomacocha (Leimebamba-Balsas), *López et al.* 4398 (GH). **Huánuco:** "Casapi" (Dist. Chinchao, Casapi), *Poeppig*, Oct. 1829 (BM, w).

36. *Asplenium lorentzii* Hieron., *Bot. Jahrb. Syst.*

22: 375. 1896. LECTOTYPE (designated here): Argentina, Prov. Salta, Yacone, at foot of Nevada del Castillo, *Hieronymus & Lorentz* 304 (B!, photo, F; islectotype, B!). SYNTYPE: Argentina, Siambon, Sierra de Tucumán, *Hieronymus & Lorentz* 896 (B!).

Plants terrestrial. **Stem** erect or decumbent, provided with linear, attenuate scales, these 1–3 mm long, clathrate, gray-brown to blackish. **Leaves** fasciculate, 1-pinnate, 16–30 cm long, 1.7–2.7 cm broad. **Petiole** 4–10 cm long, 0.8–1 m thick, reddish- or greenish brown, not or narrowly alate, glabrous, or with glandular trichomes. **Lamina** membranaceous, linear, gradually tapering to a pinnatifid apex, somewhat reduced at base, glabrous, or with scattered, minute, glandular trichomes. **Rachis** straight or slightly flexuous, glabrous or with glandular trichomes, narrow-alate, proliferous buds rare or lacking. **Pinnae** numerous, 10–14 mm long, subopposite or alternate, sessile, subdimidiate, most of them rhombic, deeply dentate, patent, or proximal ones deflexed, lacking a distinct midrib. **Veins** distinct, slightly darker than the laminar tissue, 1–2 on basisopic side of pinna, 4–6 on acroscopic side, 1–2-forked, the basal acroscopic ones subflabellately dichotomous. **Sori** 4–6 on larger pinnae. **Indusia** thin, yellowish or greenish, oblong-elliptic.

Thus far known in Peru by the lone collection cited below, on the ground, 700 m, Arequipa.

Peru; Bolivia; Argentina.

The sole collection from Peru differs slightly from the type in that pinnae are patent and moderately provided with minute, glandular trichomes on the abaxial surface. In the lectotypes and paratypes from Argentina laminae are glabrous, and pinnae are frequently deflexed. If these differences are substantiated by subsequent collections in Peru, it may warrant separation at an infraspecific level.

This species is a low-elevation plant related to *A. peruvianum* and *A. gilliesii*. It is a more robust fern with stouter petiole, longer leaves, larger pinnae, and more numerous sori.

Arequipa: Lomas of Atequipa, *Coronado* 34 (GH, UC, US).

37. *Asplenium gilliesii* Hooker, *Exot. fl.* 3: 208 (overleaf). 1827. TYPE: Argentina, Cerro Grande Uspallata, *Gillies*, Jan. 31, 1825 (holotype, K!; frag., GH!; ISOTYPE, GH!).

Asplenium gillesianum Hooker, Icon. fil. 1: t. 73. 1829, *nom. nov.* (an illegitimate renaming of *A. gilliesii*, and with the same type).

Plants epipetric, rarely terrestrial. **Stem** small, erect, provided with linear, attenuate scales, these 1.5–3 mm long, narrow-clathrate, blackish, sublustrous. **Leaves** fasciculate, 1-pinnate, 8–20 cm long, (0.8–)1–1.5 cm broad. **Petiole** 2–8 cm long, 0.2–0.4 mm thick, stramineous or greenish, marginate or very narrowly alate. **Lamina** thin-herbaceous, linear, gradually tapering to a pinnatifid apex, somewhat reduced at base, provided abaxially with minute, bacilliform glands. **Rachis** thin and flexuous, greenish, sparsely provided with minute, glandular trichomes, scarcely or narrowly alate, proliferous buds rare or lacking. **Pinnae** 7–20 pairs, 4–8 mm long, subopposite or alternate, sessile or with short, greenish stalks, rhombic or subflabellate, lacking a costa, veins ending in acute, broad and deep, cuspidate lobes. **Veins** commonly distinct, slightly darker than the lamina tissue, subflabellately dichotomous. **Sori** 2–3 on a pinna. **Indusia** thin, yellowish or grayish green, oblong-elliptic.

In rock crevices, or among rocks in dry meadows, 2750–4000 m, Ancash and Huánuco south to Ayacucho and Puno.

Peru; Bolivia; Argentina.

Very closely related are *A. peruvianum* and *A. projectum*, all three high-elevation ferns with linear leaves and blackish, linear scales. See *A. peruvianum* for further discussion.

Ancash: Prov. Bolognesi, E of Huasta, *Cerrata* 2173, 2473 (GH, USM). **Huánuco:** Yanahuanca, *Macbride & Featherstone* 999 (F). **Lima:** Prov. Yauyos, Capia, below Tupe, *Cerrate* 1069 (GH, USM). **Ayacucho:** Prov. Parí-nacocha, Incuyo, *Hutchison* 1270 (F, NY, UC). **Cuzco:** Prov. Urubamba, road to Ollanta, *Vargas* 23280 (F, GH). **Puno:** Above Lake Titicaca, *Mexia* 7782 (F, GH, MO, UC, US).

38. *Asplenium peruvianum* Desv., Mém. Soc. Linn. Paris 6: 271. 1827. TYPE: Peru, collector undesignated, perhaps *Dombey* (holotype, P!, *Herb. Desv.*; photos, GH, US).

Asplenium fragile Presl, Tent. pterid. 108. 1836. TYPE: "Montanis Peruviae," *Haenke* (holotype, PRL; frag., NY!; isotype, PRC!; photos, F, GH & US of PR, F of PRC).

Plants epipetric, rarely terrestrial. **Stem** erect, provided with lanceolate or linear-lanceolate scales,

these 1–1.5 mm long, clathrate, blackish, sublustrous. **Leaves** densely caespitose, 1-pinnate, 6–30 cm long, 0.6–1.5(–2) cm broad. **Petiole** 1–10 cm long, commonly 0.5–1 mm thick, dull grayish to reddish brown, scarcely alate, provided with a few filiform scales and minute, clavate trichomes, or glabrescent. **Lamina** firm-herbaceous or chartaceous, linear, gradually tapering to a pinnatifid apex, somewhat to strongly reduced at base. **Rachis** typically straight, rigid, and reddish brown, occasionally thin, flexuous and greenish, with indument as on the petiole, narrow-alate to marginate, sometimes with a proliferous bud in a proximal pinna axil. **Pinnae** 12–30 pairs, 4–8(–10) mm long, subopposite, sessile or subsessile, rhombic, a distinct costa lacking (or rudimentary at pinna base), margins entire or shallowly to deeply dentate, rarely lobed. **Veins** distinct to obscure, subflabellately dichotomous. **Sori** 4–6 on a pinna. **Indusia** yellowish or greenish, narrow-elliptic.

In open forests or thickets, in rock crevices, on and among rocks, or in rocky soil, 2750–4500 m, Cajamarca and La Libertad south to Ayacucho and Puno.

Venezuela and Colombia south to Chile.

The type specimen of *Asplenium peruvianum* consists merely of a single leaf, minus the stem, so the valuable character of stem scales is lacking. This matches the holotype of *A. fragile*, which also lacks stem scales, and the isotype (PRC), which has both stem and scales. The holotype label of *A. peruvianum* cites no data as to collector, number, or specific locality. There is another specimen at Paris, collected by Dombey at Tarma (Junín) also originally determined to be *A. peruvianum*. The label of a Morton photo (US) states that "... it may be the original plant from which the fragment which is the type was taken." This specimen is complete with a dozen densely caespitose leaves and small, blackish, clathrate, stem scales and is identical to the isotype of *A. fragile* in every way. It is unfortunate that this familiar name for a common South American species of *Asplenium* must be subsumed under *A. peruvianum*.

This is part of a species complex that includes *A. gilliesii* and *A. projectum* as well as *A. trichomanes-dentatum* L. of Central America and the West Indies. They are all small ferns with linear, 1-pinnate leaves, blackish, linear stem scales, and laminae with scattered filiform scales and glandular trichomes. *Asplenium gilliesii* and *A. peruvianum* may be simply variants (witnessed by the intermediates cited separately below), and *A.*

trichomanes-dentatum is a low-elevation form with smaller sterile leaves in a rosette pattern. (The name *A. trichomanes-dentatum* was later changed by Linnaeus to *A. dentatum*, and some authors still disagree on the application of the rules toward determination of the valid name. For further discussion of the nomenclature problem, see Stolze [Fieldiana, Bot., n.s., 6: 92. 1981].) Monographic revision is needed.

These species have close affinities with *A. triphyllum* and *A. cladolepton*, as well as with high-altitude plants with narrow leaves. The last two differ principally in their more dissected leaves. In addition, *A. triphyllum* has scattered, minute, glandular trichomes on the petiole.

Cajamarca: Prov. Cajamarca, El Gavilán, road Cajamarca-Chilete, *Ferreira* 3256 (USM). **La Libertad:** Prov. Otuzco, Cerro facing Río Bado, *Aguado* 6741 (GH). **Ancash:** Prov. Recuay, Pativilea-Huaraz Hwy., *D. Smith* 8306 (MO). **Huánuco:** Mito, *Bryan* 207 (F). **Lima:** Río Blanco, *Killip & Smith* 21707 (F, GH, US). **Junín:** NE of Huancayo, between Acopalca and Huari, *Duncan et al.* 2746 (MO, UC, US). **Ayacucho:** Between Huanta and Hacienda Pargora, *Killip & Smith* 23316 (US). **Cuzco:** Prov. Cuzco, near Saxihuamán, *Tryon & Tryon* 5350 (F, GH). **Puno:** Valley 10 mi NE of Macusani, *Webster* 7 (K).

Intermediate between *A. gilliesii* and *A. peruvianum*:

Cajamarca: Near Hacienda Porcón, N of Cajamarca, *Correll & Smith* P875 (GH, US). **Lima:** Chicla, *Ball* (GH). **Cuzco:** Prov. Anta, below Chinchaypujio, *Vargas* 17186 (GH).

39. *Asplenium quitense* Hooker, Sec. cent. ferns, t. 20. 1860. TYPE: Ecuador, Andes of Quito, Archidona, *Jameson* 707 (holotype, K!; probable isotype, K!).

Plants epiphytic. **Stems** minute, compact, bearing leaves singly or in small clusters, several to many of these commonly connected by long, creeping, stoloniform roots, scales lacking. **Leaves** 1–6 to a stem, 1-pinnate, 3–11 cm long, 0.8–1.8 cm broad. **Petiole** 0.5–3.5 cm long, marginate or very narrow-alate to base, greenish to yellowish, glabrous but sometimes with a few dark brown, subclathrate scales at base, these 0.1–0.4 mm long and nearly as broad. **Lamina** thin- to firm-herbaceous, glabrous, lanceolate or oblong-lanceolate, rather abruptly reduced to a pinnatifid apex or with a nonconform terminal segment, not or scarcely reduced at base. **Rachis** marginate or narrow-alate, lacking proliferous buds. **Pinnae** 5–10

pairs, to 10 mm long and 7 mm broad, stalked, irregularly obovate or rhombic, strongly inequilateral, the base acroscopically truncate and the margin with 1–3 shallow or deep, obtuse lobes, basiscopically narrow-cuneate and the margin entire or with a single lobe toward the apex. **Veins** simple or 1-forked, mostly obscure, commonly 2 (3) on acroscopic side of midrib and only 1 basiscopically. **Sori** usually 1–3 per pinna. **Indusia** yellow to brownish, linear or narrow-oblong.

In dark, wet forests, on trunks or branches of trees, or on fallen logs, 700–1200 m, Pasco and Cuzco.

Colombia; Ecuador; Peru.

As in *A. escaleroense*, the stem of this species lacks scales and often produces long, stoloniform roots, which at intervals in turn produce other stems. This root system may extend for more than 40 cm along a tree trunk or branch. However, the former species has merely lobed or pinnatifid leaves, whereas *A. quitense* has distinctly stalked and lobed pinnae.

Pasco: Prov. Oxapampa, Palcazú Valley, Río Cacadú, *Foster & Smith* 9427 (F, MO). Prov. Oxapampa, Río Cacadú, 56 km from Villa Rica, *D. Smith & Foster* 2663 (F, MO). **Cuzco:** Altura de Tintiniquiato, *Bües* 1752 (US). Prov. Paucartambo, Cosñipata Hacienda María, *Vargas* 10206 (UC). Prov. Paucartambo, Cosñipata Valley, Río Tono, *Wachter et al.* 189 (F).

40. *Asplenium pulchellum* Raddi, Opusc. Sci. 3: 291. 1819. TYPE: Brazil, Mandiocca, *Raddi* (holotype, FI; isotype, BR; photos, BM, F & US of BR).

Asplenium poloense Rosenst., Repert. Spec. Nov. Regni Veg. 12: 469. 1913. TYPE: Bolivia, North Yungas, Polo-Polo, near Coroico, *Buchtien* 3345 (holotype, S!; isotypes, B!, US!).

Plants terrestrial or epipetric, very rarely epiphytic. **Stem** erect, provided with linear or lanceolate, often attenuate, scales, these 1–3 mm long, narrow-clathrate, blackish, sublustrous. **Leaves** fasciculate, 1-pinnate, 6–16 cm long, 1.3–3 cm broad. **Petiole** 1–2.5 cm long, reddish brown to greenish, narrow-alate to marginate, provided with a few, scattered, dark, filiform scales. **Lamina** membranaceous, lanceolate or linear-lanceolate, gradually reduced to a pinnatifid, long-acuminate or subcaudate apex, somewhat reduced at base. **Rachis** reddish or greenish brown, with a few, dark, filiform scales, narrow-alate, proliferous buds

lacking. **Pinnæ** 7–15 pairs, 8–14 mm long, short-stalked, somewhat to strongly ascending, subdimidiate, conspicuously inequilateral for half their length or more, acroscopic margin deeply and acutely cleft, the basiscopic essentially entire, the apex acute. **Veins** usually distinct, 3–5 on the acroscopic side of pinnæ, 1–3 on the basiscopic, all simple except forked at the base acroscopically, all borne along the principal vein running near and parallel to the basiscopic margin. **Sori** commonly 3–7 on a pinna. **Indusia** thin, yellowish or greenish, oblong-elliptic.

In deep, wet forests, on the ground or on or among rocks, very rarely at the base of tree trunks, 400–1800 m, San Martín, Huánuco, Junín, Madre de Dios.

Ecuador; Peru; Bolivia; Brazil.

This has been confused with *A. otites* (see **Comments** below), but the latter is a more robust plant with a stouter, much longer petiole; also pinnæ are larger and are equilateral except toward the base, and have more veins and serrations. *Asplenium otites* has not been found in Peru, but it is apparently somewhat common in northern South America; *A. pulchellum* does not occur in northern South America.

The Schunke collection from San Martín (cited below) is atypical in that pinnæ are not strongly subdimidiate, but it matches *A. pulchellum* in every other way.

San Martín: Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Fundo La Campiña, *J. Schunke* V. 3428 (F, GH, US). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Hda. San Carlos, *Mexia* 8251a (UC, US), 8256a (US). **Junín:** Chanchamayo Valley, *C. Schunke* 177, 180, 221, 773, 940, 1364 (all F). **Madre de Dios:** Prov. Manú, Manú Park, Cocha Cashu uplands, *Núñez* 5775 (MO).

41. **Asplenium discrepans** Rosenst., Repert. Spec. Nov. Regni Veg. 12: 469. 1913. TYPE: Bolivia, North Yungas, Polo-Polo, near Coroico, *Buchtien* 3341 (holotype, B?; isotypes, GH!, US!).

Plants epipetric or terrestrial. **Stem** erect, provided with linear, attenuate scales, these 2–3 mm long, narrow-clathrate, blackish, sublustrous. **Leaves** fasciculate, 1-pinnate, 6–16(–20) cm long, 1–3 cm broad. **Petiole** 1–3.5 cm long, reddish brown to greenish, narrow-alate, provided with scattered, dark, filiform scales. **Lamina** thin-herbaceous, lanceolate, gradually tapering to an acute, pinnatifid apex, somewhat reduced at base. **Rachis**

reddish brown or greenish, provided with scattered, dark, filiform scales, narrow-alate, proliferous buds lacking. **Pinnæ** 10–20 pairs, 6–15 mm long, sessile or with short, greenish stalks, patent or slightly ascending, subdimidiate, conspicuously inequilateral for half their length or more, acroscopic margin crenate-serrate, the basiscopic essentially entire, the apex obtuse. **Veins** 4–6 and mostly forked on acroscopic side of pinna, 1–3(–4) and unbranched basiscopically, all borne along a principal rib running near and parallel to the basiscopic margin. **Sori** commonly 4–8 on a pinna. **Indusia** thin, yellowish or greenish, oblong-elliptic.

In forests, on rocky hillsides and ravine banks, or on and among rocks, 700–1400 m, San Martín, Junín, Cuzco.

Peru; Bolivia; Paraguay.

This is frequently identified as *A. pulchellum*. Besides the characters of the key, it also differs from the latter in its usually patent or slightly ascending pinnæ. Pinnæ of *A. pulchellum* typically are borne on the rachis at a very acute angle, although occasionally they may be slightly ascending.

San Martín: Tarapoto, *Spruce* 3966 (BR, GH, US). **Junín:** San Francisco de Satipo, along Río Satipo, *Solomon* 3233 (MO). Yaupi, *Woytkowski* 6501 (MO, US), 6504 (MO, US). **Cuzco:** Santa Ana, *Cook & Gilbert* 1535 (US), 6501 (MO, US), 6504 (MO, US). Santa Rosa, Urubamba Valley, *Cook & Gilbert* 1726 (US). Prov. La Convención, Potrero, *Tryon & Tryon* 5381 (GH).

42. **Asplenium pteropus** Kaulf., Enum. fil. 170. 1824. TYPE: Brazil, *Chamisso* (holotype, LE).

Plants epiphytic, sometimes terrestrial. **Stem** erect or decumbent, provided with narrowly clathrate, linear or lanceolate, acute to attenuate scales, these 3–5 mm long, gray-brown or castaneous. **Leaves** 1-pinnate, fasciculate, 15–45(–60) cm long, 2.5–6 cm broad. **Petiole** 1–5 cm long, dull grayish to reddish brown, with a few, scattered, linear to filiform scales, broadly alate distally or throughout. **Lamina** glabrous, thin- to firm-membranaceous, narrow-elliptic, gradually and conspicuously reduced at both ends, terminating in a pinnatifid, occasionally proliferous, apex. **Rachis** dull reddish or greenish brown, broadly alate, each wing often as broad as the rachis, naked, or with scattered filiform scales. **Pinnæ** 1.5–3 cm long, numerous, approximate to subdistant, sessile, acute to obtuse, conspicuously inequilateral at base, ba-

siscopically cuneate to excavate, acroscopically truncate and often subauriculate, the margins deeply serrate to serrulate. **Veins** distinct, 5–10 pairs, simple, except forked at or near the pinna base acroscopically. **Sori** commonly 7–12 on larger pinnae. **Indusia** yellowish to hyaline, narrowly elliptic.

Rare in Peru, in deep forests, on tree trunks or on the forest floor, 400–1950 m, San Martín, Huánuco, Junín, Ayacucho.

Southern Mexico to Panama; West Indies; Colombia to Guyana, south to Bolivia and Brazil.

The taxonomy of this species has been confused, treated by various authors in a strict to a broad sense, and it is in need of much closer scrutiny. Broadly delimited, it includes rather thin-textured plants with short or medium-length petioles, tapered gradually to a pinnatifid apex and with a somewhat or strongly reduced base, the rachis and petiole broadly alate, pinnae conspicuously inequilateral at base, with veins mostly simple. In a strict sense, the species would be confined to those plants with petioles only a few centimeters in length and with laminae strongly and gradually reduced to auriclelike basal pinnae. Plants previously determined as *A. pteropus* Hieron., with somewhat longer petioles and with five or six proximal pinnae somewhat, but not greatly, reduced are probably other species: in Central America perhaps *A. barbaense* Hieron., in South America perhaps *A. raddianum* or (in Ecuador) *A. rosenstockianum* Brade. The first two have narrow rachis wings, the last strongly alate wings as in true *A. pteropus*. For purposes of this flora, *A. pteropus* is delimited in a strict sense and, as such, is not very common in Peru.

San Martín: Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Quebrada de Saule Chico, *J. Schunke* V. 4358 (F, US). **Huánuco** (as San Martín): Tingo María, across the Huallaga on trail to “Monson” (Monzón), *Allard* 21864 (US). **Junín:** Prov. Chanchamayo, Río Rundayacu, 45 km from San Ramón, *D. Smith et al.* 2614 (F, GH). La Merced, Chanchamayo, *Soukup* 1067, in part (F). **Ayacucho:** Río Apurímac Valley, near Kimpitiriki, *Killip & Smith* 22918 (F, US).

43. *Asplenium sessilifolium* Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. 5: 322. 1811. TYPE: “Habitat in America aequinoctiale,” collector undesignated (holotype, P, *Herb. Jussieu* 1265; isotype, B; photos, BM, GH, US of P).

Plants terrestrial, at least in Peru. **Stem** stout, erect or decumbent, provided with clathrate, linear or lanceolate, attenuate scales, these 2–5 mm long, gray-brown to blackish, often with narrow, lighter brown margins. **Leaves** 1-pinnate, caespitose, 20–40 cm long, 2–5 cm broad. **Petiole** 3–16 cm long, gray-brown to atropurpureous or blackish, dull or slightly lustrous, naked or with a few lanceolate scales, not or scarcely alate. **Lamina** glabrous, thin- to firm-herbaceous, linear or narrow-elliptic, gradually and strongly reduced at both ends, terminating in a pinnatifid (rarely proliferous) apex. **Rachis** castaneous to atropurpureous (occasionally grayish brown), narrow-alate to marginate, naked or with a few dark, filiform scales. **Pinnae** 1–3 cm long, numerous, approximate to crowded, sessile, conspicuously inequilateral at base, basiscopically cuneate to excavate, acroscopically truncate and incised nearly to costa to form a nearly free basal auricle (occasionally opposed by a smaller basiscopic auricle), the rest of the pinna serrate, crenate, or shallowly lobed. **Veins** distinct, 4–7 pairs, simple, or subflabellate in the auricles. **Sori** 8–12 on larger pinnae. **Indusia** thin, linear or elliptic, yellowish or hyaline.

On rocky slopes and wet ravine banks of cloud forests, 2500–3600 m, Cajamarca, Junín, Ayacucho, Apurímac, Cuzco.

Southern Mexico to Costa Rica; Greater Antilles; Ecuador; Peru; Bolivia.

Pinnae of *Asplenium triphyllum* are typically bi- or trifoliate, but in occasional plants they may vary in having extra lobes, crenations, or serrations, and such specimens sometimes have been identified as *A. sessilifolium*. However, the two differ significantly in indument. In the latter, the blackish stem scales are 2–5 mm long and often have narrow, brown margins, and petiole and rachis are naked or with a few, scattered, lanceolate or filiform scales. In *A. triphyllum*, the blackish stem scales are usually less than 2 mm long and lack lighter colored margins, and axes are sparsely to moderately provided with filiform scales and glandular trichomes.

Cajamarca: Prov. Celendín, canyon of Río Marañón above Balsas, *Hutchison & Wright* 5295 (UC). **Junín:** Huari, *Kunkel*, 1960 (B). **Ayacucho:** Prov. La Mar, above Jano, *Plowman & Davis* 4677 (GH). Between La Quinua and Tambo, *Soukup* 5625 (US). **Apurímac:** Forests of Ampay, *Vargas* 1069 (GH, MO). **Cuzco:** Prov. La Convención, Dist. Vilcabamba, between Rumichurco and Alcobamba, *Davis et al.* 1235 (F, GH). Prov. La Convención, Choquequiran, *Vargas* 12999 (F).

44. *Asplenium tabinense* Hieron. Hedwigia 60: 224. 1918. TYPE: Peru, near Tabina (Puno), *Lechler 2105* (holotype, B!; photo, F).

Plants terrestrial, at least in Peru. **Stem** erect or decumbent, provided with narrowly clathrate, lanceolate or linear-lanceolate, attenuate scales, these 2.5–4 mm long, blackish, with hairlike tip and scattered marginal cilia (the latter processes usually broken away in dried plants). **Leaves** 1-pinnate, fasciculate, 15–33 cm long, 2–4 cm broad. **Petiole** 1–5 cm long, atropurpureous, dull or slightly lustrous, with scattered, dark, filiform scales, narrow-alate or marginate. **Lamina** glabrous, membranaceous, narrow-elliptic, gradually and conspicuously reduced at both ends, terminating in a pinnatifid, usually attenuate, apex. **Rachis** atropurpureous, narrow-alate, naked or with scattered, dark, filiform scales. **Pinnae** 1.2–2 cm long, numerous, approximate to crowded, subsessile, conspicuously inequilateral at base, basiscopically cuneate to excavate, acroscopically truncate and often auriculate, the auricle sometimes incised nearly halfway to midrib, the rest of the pinna narrowly and deeply crenate. **Veins** (3)–4–5 and simple on the basiscopic side of larger pinnae, 5–7 on the acroscopic side, simple, except subflabellate in the basal auricle and forked in the adjacent lobe. **Sori** commonly 4–7 on larger pinnae. **Indusia** thin, narrow-elliptic, yellowish or hyaline.

On densely wooded slopes or in thickets, 1500–3100 m, Huancavelica, Ayacucho, Cuzco, Puno. Peru; Bolivia.

All specimens seen from Bolivia are epiphytes, whereas plants in Peru grow on the forest floor. Besides the characters cited in the key, this also differs from *A. sessilifolium* in the more delicate lamina, usually firm-herbaceous in the latter, and membranaceous in *A. tabinense*. The rachis in *A. sessilifolium* varies from atropurpureous to castaneous (rarely lighter colored), but it is always atropurpureous in *A. tabinense*, at least on mature leaves. This perhaps might be considered merely a geographic variant of the widespread *A. sessilifolium*.

Huancavelica: Prov. Tayacaja, Ampurco, between Salcabamba and Surcubamba, *Tovar 3768* (GH). **Ayacucho:** Ccarrapa, between Huanta and Río Apurímac, *Killip & Smith 22385* (US). **Cuzco:** Quillabamba, Santa Teresa, 0.5 km W of La Playa, *Peyton & Peyton 1236* (MO). Prov. La Convención, Huayopata, Pistipata drainage, *Peyton & King 1429* (MO). Prov. Calca, near Mantio, *Vargas 15594* (GH).

45. *Asplenium herzogii* Rosenst., Meded. Rijks. Herb. 19: 12. 1913. TYPE: Bolivia, Incacoral, *Herzog 2211* (holotype, B?; isotype, US!; photo, F of US).

Plants terrestrial. **Stem** erect, provided with obscurely clathrate, lanceolate scales, these 2–3 mm long, gray-brown, acuminate. **Leaves** 1-pinnate, fasciculate, 25–50 cm long, 3–5.5 cm broad. **Petiole** 6–12 cm long, gray-brown, narrowly to vestigially alate. **Lamina** linear, gradually reduced to a subcaudate, proliferous apex, slightly reduced at base, with a few proximal pairs of pinnae about half the length of the longest ones. **Rachis** dull red or gray-brown, narrow-alate. **Pinnae** 2–2.8 cm long, 16–25 pairs, apex obtuse or subacute, inequilateral at base, basiscopically cuneate, acroscopically truncate and subauriculate, the margins crenate-serrate. **Veins** 5–8 pairs, simple, except forked near the pinna base acroscopically. **Sori** 9–15 on larger pinnae. **Indusia** thin, hyaline or yellow-brown, narrow-elliptic, entire.

Thus far known in Peru from one collection, in thicket, about 2750 m, Huánuco.

Peru; Bolivia.

This may be confused with *A. alatum* because of the subcaudate, proliferous rachis but is easily separated from the latter by the narrow rachis wings and by the strongly inequilateral pinna bases. In *A. alatum* the wings on the rachis (and usually the petiole) are very broad (1–2 mm), and pinnae are mostly subequilateral. *Asplenium herzogii* is most closely related to *A. raddianum*, from which it can be distinguished by the proliferous rachis, the smaller (2–3 mm vs. 4–6 mm) stem scales and the linear lamina.

Huánuco: Chaglla, *Macbride 3639* (F).

46. *Asplenium bangii* Hieron., Hedwigia 60: 245. 1918. TYPE: Bolivia, *Bang 2419* (holotype, B; isotypes, F!, NY!, US!).

Plants terrestrial, rarely epiphytic or epipetric. **Stem** erect, provided with obscurely clathrate, linear or linear-lanceolate, attenuate, scales, these 1.5–3 mm long, blackish, sublustrous, their margins subentire. **Leaves** 1-pinnate, caespitose, 30–65 cm long, 3.5–5 cm broad. **Petiole** (5)–6–15 cm long, dull purplish to reddish brown, narrowly to vestigially alate. **Lamina** linear or linear-lanceolate, gradually reduced to a pinnatifid apex scarcely reduced at base or several proximal pairs about

half the length of the longest ones. **Rachis** dull purplish or reddish brown, narrow-ate (rarely the wing rather broad), lacking proliferous buds. **Pinnae** (larger ones) 1.2–2.2(–2.5) cm long, (30–)35–45 pairs, usually obtuse at apex, conspicuously inequilateral at base, basiscopically cuneate to excavate, acroscopically truncate and often subauriculate, the margins subentire to crenulate. **Veins** 8–12 on acroscopic side of costa, 5–8 basiscopically, simple, except forked at or near the pinna base acroscopically. **Sori** 12–18 on larger pinnae. **Indusia** thin, yellowish or hyaline, margins entire.

In damp forests, on wooded slopes and canyon walls, commonly on the forest floor, rarely on cliffs or tree trunks, 650–2150 m, Huánuco, Pasco, Junín.

Peru; Bolivia; Brazil.

With this perhaps should be included *A. clausenii* Hieron. of Brazil, northern South America, and the Greater Antilles, of which Hieronymus recognized three forms, based on minor differences in length, margin and apex of pinnae. Morton and Lellinger (1966, p. 16) designated *Fendler 138*, Venezuela (B; photo, US), the lectotype for this name, but unfortunately this specimen was unavailable for examination during our study. In the Field Museum herbarium, there is a sheet of *Fendler 138*, containing laminae of three different species. The center one is possibly *A. clausenii* and is very similar to *A. bangii*, but it lacks petiole and stem for definitive comparison. Given the apparent variability of *A. clausenii*, the entire complex (including *A. drepanophyllum* and *A. pulchellum*) should be subjected to closer scrutiny. Therefore, *A. clausenii* is excluded from Peru for purposes of this treatment.

Huánuco: Muña, *Bryan 433* (F, GH). Muña, *Macbride 4010* (F, GH, US). **Pasco:** Prov. Oxapampa, Valle del Palcazú, Río Cacazú, *León 678* (F, USM). **Junín:** La Merced, *Macbride 5372* (F, GH, US). Chanchamayo Valley, *C. Schunke 1371* (F in part, US). Prov. Tarma, Huacapistana, *Tryon & Tryon 5453* (F, GH, UC, US, USM).

47. ***Asplenium harpeodes*** Kunze, *Linnaea* 18: 329. 1844. LECTOTYPE (designated by Morton & Lellinger, Mem. New York Bot. Gard. 15: 15. 1966): Mexico, *Leibold 26* (B!; photos, US).

Plants terrestrial or epiphytic. **Stem** erect or decumbent, provided with clathrate, linear scales, these 4–10 mm long, deep brown or blackish, lustrous, terminating in a long, tortuous, unicastate tip. **Leaves** 1-pinnate, caespitose, 30–120 cm long

4–12 cm broad. **Petiole** 5–10 cm long, dull yellowish to reddish brown or purple-gray, wings lacking or vestigial. **Lamina** linear or linear-lanceolate, gradually reduced to a pinnatifid apex, scarcely reduced at base, or several proximal pairs about half the length of longest ones. **Rachis** atropurpureous, narrow-ate, lacking proliferous buds. **Pinnae** (larger ones) 2.5–9 cm long, (24–)30–50 pairs, long-attenuate, inequilateral at base, basiscopically excavate, acroscopically truncate, often subauriculate (but the basal lobe never incised more than halfway to the costa), the margins deeply, serrately lobed. **Veins** 12–20 pairs, mostly simple, except subdichotomously forked in the acroscopic auricle. **Sori** numerous. **Indusia** thin, yellowish, brownish or hyaline, margins subentire.

Common, on the earth in wet forests and thickets, in humus, on wet banks, or rocky soil or on mossy rocks, often on tree trunks, 1500–3600 m, Cajamarca to San Martín, south to Huancavelica and Puno.

Southern Mexico to Panama; Greater Antilles; Colombia and Venezuela south to Bolivia and Brazil.

In addition to the characters cited in the key, this usually can be recognized by the narrowly and deeply lobed pinnae that very gradually taper to long-attenuate tips. However, several depauperate specimens have been seen that have merely strongly serrate margins and acute tips. In these, the purple rachis and the stem scales with long, tortuous tips are diagnostic. This is one of the most common species of the genus in the Neotropics.

Cajamarca: Colosay, *Woytkowski 7010* (GH, MO, US). **Amazonas:** Prov. Chachapoyas, W of Molinopampa, *Wurdack 1471* (GH, US, USM). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young 4171* (USM), *Young & León 5011* (USM). **Huánuco:** Cani, 7 mi NE of Mito, *Macbride 3390* (F, GH, US). **Pasco:** Prov. Oxapampa, 2–4 km N of Mallampampa, *D. Smith & Canne 5865* (MO). **Junín:** Chanchamayo Valley, above La Merced, *Hutchison 1197* (F, NY, UC, US). **Huancavelica:** Prov. Tayacaja, Chuspi, near Tocas, *Tovar 2063* (USM). **Ayacucho:** Prov. La Mar, between El Tambo and Ayna, *Plowman & Davis 4675* (GH), *4680* (GH). **Apurímac:** Forests of Ampay, *Vargas 1065* (GH). **Cuzco:** Prov. Urubamba, Cuzco–Quillabamba Road, *Skog & Skog 5173* (US). **Puno:** Prov. Carabaya, between Ayapata and K'ahualluyoc, *Vargas 10763* (GH).

48. ***Asplenium raddianum*** Gaud., in Freycinet, Voy. Uranie, Bot., 316. 1828. *Nom. nov.* for *A. brasiliense* Raddi and based on the same type.

Asplenium brasiliense Raddi, Pl. bras. nov. gen. 1: 36, t. 51, f. 1. 1825, not Swartz, 1817. TYPE: Brazil, Prov. Rio de Janeiro, *Raddi* (holotype, FI; isotype, BR; photo, BM of BR).

Plants terrestrial, occasionally epiphytic. **Stem** erect, but often slender and elongate, provided with obscurely clathrate, ovate- to linear-lanceolate scales, these 4–6 mm long, gray-brown, acute to attenuate. **Leaves** 1-pinnate, fasciculate, 25–50 cm long, 4–7 cm broad. **Petiole** 6–10 cm long, reddish or grayish brown, wings narrow or vestigial. **Lamina** lanceolate or elliptic-lanceolate, gradually reduced to a pinnatifid apex, scarcely reduced at base, or several proximal pairs about half the length of the longest ones. **Rachis** dull reddish or grayish brown, narrow-alate, lacking proliferous buds. **Pinnae** (larger ones) 2.5–3.5 cm long, (12–)15–24 pairs, apex acute to obtuse, inequilateral at base, basiscopically excavate, acroscopically truncate, often subauriculate (but the basal lobe never incised more than halfway to the costa), the margins deeply serrate or serrately lobed. **Veins** usually 8–11 on acroscopic side of costa, 6–9 basiscopically, simple, except forked at or near the pinna base acroscopically. **Sori** 10–16 on larger pinnae, frequently diplazioid in the acroscopic auricle. **Indusia** yellowish to light brown, margins subentire.

On wet slopes or in litter on the forest floor, occasionally on trunks of trees or tree ferns, 1000–2800 m, Cajamarca and Amazonas south to Cuzco and Puno.

General distribution uncertain; probably Venezuela and Colombia; Brazil; Peru; possibly Bolivia.

There is some question as to proper application of this name for the plants so circumscribed here. The type was not seen, but the specimens cited below closely match the description and most herbarium specimens identified as *A. raddianum*. *Asplenium barbaense* Hieron., from Costa Rica, may belong here, as the two species differ only quantitatively and even share the distinctive feature of having relatively frequent diplazioid sori in the basal acroscopic pinna auricle. Otherwise, *A. barbaense* essentially differs only in having narrower, more delicate laminae, proximal pinnae with short stalks, broader petiole and rachis wings. Perhaps plants from Costa Rica and northern South America represent an infraspecific variant of those from Peru, Bolivia, and Brazil. Further study is required.

Cajamarca: Colasay, *Woytkowski* 7011 (MO, US). Ama-

zonas: Prov. Bongará, Shillac, N of Pedro Ruíz, *D. Smith & Vásquez* 4885 (MO, UC). **San Martín**: San Roque, *L. Williams* 7189 (US). **Ancash**: Prov. Huaráz, Dist. Huaráz, behind Hotel Monterrey, *Saunders* 1282, atypical (F, GH). **Pasco** (as Junín): Pichis Trail, “Yapas” [Yapaz], *Killip & Smith* 25520 (US). **Junín**: Schunke Hacienda above San Ramón, *C. Schunke* A208 (GH, US). Chanchamayo Valley, *C. Schunke* 108 (US). **Cuzco**: Urubamba, Machu Picchu, *Peyton & Peyton* 372 (MO). **Puno**: Prov. Carabaya, San Gabán, *Vargas* 18913, atypical (GH).

49. *Asplenium alatum* Willd., Sp. pl. ed. 4, 5: 319. 1810. TYPE: Venezuela, Nova Andalusia, near Caripe, *Humboldt & Bonpland* (holotype, B, *Herb. Willd.* 19889; isotype, P; photos, F & GH of B).

Plants terrestrial, rarely epipetric. **Stem** erect, provided with obscurely clathrate, ovate or ovate-lanceolate scales, these 2–3 mm long, gray-brown acute. **Leaves** 1-pinnate, crowded to subfasciculate, 20–50 cm long, 7–11 cm broad. **Petiole** 6–15 cm long, dull greenish or grayish brown, conspicuously alate, often to base. **Lamina** broadly lanceolate to oblong, rather abruptly terminating in a short-ligulate, proliferous tip, not or scarcely reduced at base. **Rachis** dull reddish or greenish brown, broadly alate, the wings each 1–2 mm broad. **Pinnae** to 7 cm long and 1.5 cm broad, 12–20 pairs, obtuse to acute, broadly cuneate to truncate or scarcely auriculate at base, subequilateral, the margins broadly serrate or biserrate. **Veins** distinct, mostly 1-forked. **Sori** 9–12 pairs on larger pinnae. **Indusia** thin, linear, yellowish or greenish, margins entire.

On the floor of wet forests or banks of wooded ravines, rarely on wet, mossy rocks, (700–)1200–2400 m, along the Cordilleras Central and Oriental, Cajamarca and Amazonas south to Cuzco.

Southern Mexico to Panama; Jamaica; Hispaniola; Colombia and Venezuela south to Bolivia and Brazil.

The very broad rachis wing and ligulate, proliferous rachis tip distinguish this from most other species of *Asplenium* in Peru.

Cajamarca: Prov. Cutervo, Grutas de San Andrés, *Llantas Quiroz & Suarez* 2734 (F, UC). Amazonas: Prov. Bongará, Quebrada Chachuaico, near Shilla, *Young et al.* 398 (MO, UC). **San Martín**: Between Moyobamba and Chachapoyas, *Croat* 58166 (F, MO). Prov. Mariscal Cáceres, Río Abiseo National Park, *Young* 4221 (HUT, USM). **Huánuco**: Muña, *Macbride* 4032 (F, US). **Pasco**: Pozuzo, Hacienda Ballisteros, *Bryan* 692 (F, US). **Junín**: Chanchamayo Valley, *C. Schunke* 57 (F, US), 721 (F, US). **Cuzco**: Prov. Paucartambo, Kosñipata Valley, *Plowman & Davis* 4936 (GH).

50. *Asplenium abscissum* Willd., Sp. pl. ed. 4, 5: 321. 1810. LECTOTYPE (designated by Morton & Lellinger, Mem. New York. Bot. Gard. 15: 26. 1966): Venezuela, Caracas, *Bredemeyer* (B, *Herb. Willd.* 19893-1, 19893-2; photos, F & GH).

Plants terrestrial, occasionally epipetric, rarely epiphytic. **Stem** erect or decumbent, provided with obscurely clathrate, linear or lanceolate scales, these 1–2.5 mm long, blackish or with very narrow brown margins. **Leaves** 1-pinnate, fasciculate, 30–50 cm long, 5–15 cm broad. **Petiole** 15–25 cm long, yellowish to reddish brown, not or scarcely alate. **Lamina** chartaceous, ovate to oblong, terminating abruptly in a broad-based, nonconform apical segment, not reduced at base. **Rachis** dull, yellowish or reddish brown, narrow-alate, lacking proliferous buds. **Pinnae** (larger ones) 1.5–12 cm long, 0.7–2 cm broad, 4–12 pairs, apex obtuse to attenuate, scarcely to strongly inequilateral at base, the margins subentire to crenate-serrate. **Veins** few to many, 1–2-forked. **Sori** linear or narrow-elliptic. **Indusia** thin, yellow to brownish, scarious, often hyaline until mature, margins subentire.

Key to Varieties

- a. Pinnae subequilateral at base, broadly cuneate acroscopically, narrowly so basiscopically, narrowly acute to attenuate at apex, commonly 6–10 times as long as broad; veins of larger pinnae 12–20 pairs 50b. var. *subaequilaterale*
- a. Pinnae conspicuously inequilateral at base, truncate acroscopically, cuneate to excavate basiscopically, obtuse to narrowly acute at apex, commonly 2–4.5 times as long as broad; veins 4–10(–12) pairs b
 - b. Pinnae 3–4.5(–6) times as long as broad, subacute to narrowly acute at apex 50a. var. *abscissum*
 - b. Pinnae 1.8–2.3 times as long as broad, broadly rounded at apex 50. var. *ruizianum*

50a. *Asplenium abscissum* var. *abscissum*.

In wet forests or wooded canyons, on slopes or on the forest floor, occasionally on rocks or rocky cliffs, rarely on bases of tree trunks or fallen logs, 300–2200 m, Cajamarca and Amazonas south to Ayacucho and Madre de Dios.

Range the same as the species.

Cajamarca: Prov. Santa Cruz, 3.2 km ENE of Montesecco, *Santisteban & Guevara* 23 (F, GH, HUT, UC). **Amazonas:** Prov. Bagua, Cerro Tapur, near Río Utcubamba, *Hutchison* 1473 in part (F, UC). **San Martín:** Juan Jui, Alto Río Huallaga, *Klug* 4312 (F, GH, MO, UC, US). **Huánuco:** Cliffs W of Río Huallaga, above bridge, *Croat* 57967a (MO in part, USM). **Pasco:** Cueva Grande, near Pozuzo,

The species occurs in the United States (Florida); southern Mexico to Peru; West Indies; Colombia and Venezuela south to Bolivia and Uruguay.

Throughout most of its broad range the features of this species are rather constant. However, in Bolivia and southern Peru a number of specimens have been found with elongated and more equilateral pinnae. Also, throughout much of Peru and occasionally growing alongside typical *A. abscissum*, there occur plants with short, broad, and obtuse pinnae, and a few of these, including a syntype of *A. ruizianum*, have been reported from Venezuela. Since these differences are merely quantitative, three taxa are recognized here as geographical variants of *A. abscissum*.

Another species, *A. congestum* C. Chr. of Ecuador, is very closely related but should be considered distinct, as its lamina is considerably smaller and membranaceous and tapers gradually to a narrow, pinnatifid apex. This contrasts with the chartaceous lamina of *A. abscissum*, which abruptly ends in a broad-based, nonconform apex.

Macbride 4791 (F, US). **Junín:** Hacienda Perene, *Coronado* 247 (GH, UC). **Ayacucho:** Ayna, between Huanta and Río Apurímac, *Killip & Smith* 22835 (F, US). **Cuzco:** Calca, *Vargas* 15595 (GH). **Madre de Dios:** Parque Nacional del Manú, Cocha Cashu Biological Station, *M. Foster* P-84-50 (UC).

50b. *Asplenium abscissum* var. *subaequilaterale* Rosenst., Repert. Spec. Nov. Regni Veg. 12: 470. 1913. TYPE: Bolivia, southern Yungas, Polo-Polo, near Coroico, *Buchtien* 3349 (holotype, presumably B).

On the ground in dark, wet forests, 800–1600 m, Junín and Ayacucho.

Peru; Bolivia.

This variety is very similar to *A. tuerckheimii* in many aspects, but it is primarily distinguished from the latter by the nonconform apical segment and the 7–12 pairs of pinnae. The lamina of *A. tuerckheimii* terminates in a conform apical segment and bears only 3–6 pairs of pinnae.

Junín: E of Quimiri Bridge, near La Merced, *Killip & Smith 23900* (US). Chanchamayo Valley, *C. Schunke 74* (F, US), *122* (US), *935* (F). **Ayacucho:** Ayna, between Huanta and Río Apurímac, *Killip & Smith 22782* (F, US).

50c. *Asplenium abscissum* var. *ruizianum* (Klotzsch) Stolze, *comb. and stat. nov. Asplenium ruizianum* Klotzsch, *Linnaea* 20: 354. 1847. LECTOTYPE (designated by Morton & Lellinger, *Mem. New York Bot. Gard.* 15: 27. 1966): Andes of Peru, *Ruiz* (B; fragment, NY!; photos, F & US).

In wet forests and wooded canyons, in the earth or on or among wet rocks, very rarely on tree trunks, 800–2700 m, Tumbes to Cuzco.

Venezuela; Peru.

Tumbes: Prov. Zarumilla, Dist. Matapalo, Bosque Nacional de Tumbes, *Schunke V. 2408* (F). **Cajamarca:** Colasay, *Woytkowski 7012* (MO, US). **Amazonas:** Prov. Bagua, 5 km above La Peca, *Croat 58353*. Prov. Bagua, Río Utcubamba, Cerro Tapur, *Hutchison 1473* (F in part, US in part, US). **Huánuco:** Muña, *Bryan 434* (F, GH, US). **Junín:** Chanchamayo Valley, *C. Schunke 74* (F, US). **Cuzco:** Prov. La Convención, Quebrada Vilcabamba, *Vargas 23397* (USM).

51. *Asplenium drepanophyllum* Kunze, *Linnaea* 9: 66. 1834, not Baker, 1874. TYPE: Peru, Pampayaco (Dept. Huánuco, Pampayacu), *Poeppig* July, 1829 (holotype, w; frag., BM!; photos, BM of w, F & GH of BM).

Plants terrestrial, rarely epipetric. **Stem** erect or decumbent, provided with narrowly clathrate, linear-lanceolate, attenuate, scales, these 2–3 mm long, dark brown to blackish. **Leaves** 1-pinnate, fasciculate, 15–40 cm long, 3–4.5(–5) cm broad. **Petiole** 4–9(–12) cm long, yellowish to reddish brown, not or scarcely alate. **Lamina** membranaceous to firm-herbaceous, linear-lanceolate, gradually reduced to a narrow, pinnatifid, usually acuminate apex, scarcely reduced at base or several proximal pairs about half the length of the longest ones. **Rachis** dull reddish brown, narrow-alate, lacking proliferous buds. **Pinnae** (larger ones) 1.2–3 cm long, 0.4–0.8 cm broad, 15–40 pairs, apex obtuse to attenuate, conspicuously inequilateral at

base, basiscopically cuneate to excavate, acroscopically truncate and often subauriculate, the margins crenulate to deeply biserrate. **Veins** 6–12 on acroscopic side of costa, (4–)5–10 basiscopically, 1–2-forked, except simple toward pinna base basiscopically. **Sori** 6–12 on larger pinnae, occasionally diplazioid. **Indusia** thin, yellowish or brownish, scarious, often hyaline until mature, margins entire.

In dense, wet forests, on the forest floor, rarely on mossy rocks, 100–1600 m, San Martín and Loreto south to Ayacucho and Madre de Dios.

Peru; Bolivia; Paraguay.

Pinna apices vary greatly from obtuse to acuminate, and extremes might be presumed different species, yet these differ from each other in no other way, and there are an infinite number of intermediate conditions. Leaves with obtuse pinnae are easily confused with *A. bangii* (under which see further discussion), but veins of the latter are all simple except at the acroscopic pinna base. *Asplenium drepanophyllum* is also similar to the enigmatic *A. otites*, discussed under **Comments** at the end of the genus treatment.

San Martín: Along Río Huallaga, NE of Shapaja on road to Chazuta, *Knapp & Mallet 6915* (F, MO). **Loreto:** Puerto Arturo, lower Huallaga below Yurimaguas, *Killip & Smith 27794* (US). **Junín:** E of Quimiri Bridge near La Merced, *Killip & Smith 23909* (F, US). Between La Merced and Satipo, *León 188* (F, USM). **Ayacucho:** Estrella, between Huanta and Río Apurímac, *Killip & Smith 23078* (US). **Cuzco:** Prov. La Convención, Río Apurímac, between Puerto Capiro and Boca de Tigre rapids, *Davis et al. 1297* (F, GH). Prov. La Convención, edges of Río Mapitunuari, *Dudley 10128* (GH, MO). **Madre de Dios:** Prov. Manú, Cocha Cashu uplands, *Nuñez 5766*, in part (MO), *6092A* (MO).

52. *Asplenium auritum* Sw., *J. Bot. (Schrader)* 1800(2): 52. 1801. TYPE: Jamaica, *Swartz* (s). (For detailed list of synonyms, see Morton & Lell., 1966, pp. 17–20.)

Plants epiphytic or terrestrial, occasionally epipetric. **Stem** erect, provided with clathrate, lanceolate to ovate scales, these 2–4 mm long, acute or acuminate, dark or grayish brown, eciliate. **Leaves** 1-pinnate or 1-pinnate-pinnatisect, rarely nearly 2-pinnate at base of proximal pinnae, fasciculate, 10–50 cm long. **Petiole** 5–20 cm long, dull green, gray, reddish brown, or blackish, not or scarcely alate. **Lamina** chartaceous to subcoriaceous, deltate to oblong-lanceolate, very gradually tapering to a pinnatifid to serrate, often subcaudate

apex, not reduced at base. **Rachis** green, gray, or reddish brown, scarcely alate, or sometimes broadly so distally, lacking proliferous buds. **Pinnæ** 1–9 cm long, usually numerous, approximate to subdistant, varying from obtuse and subentire and scarcely auriculate at base to deeply pinnatifid, subcaudate at apex, and with a nearly free basal acroscopic auricle. **Veins** indistinct or obscure, forked, or pinnately branched in larger segments. **Sori** elliptic, frequently confluent at maturity. **Indusia** firm and fleshy, opaque, commonly pale yellow or whitish, subentire.

In forests and thickets, on tree trunks and branches, on the forest floor, or occasionally on rocky soil or cliffs, 150–2900 m, Cajamarca to Loreto, south to Ayacucho and Puno.

Southern United States (Florida); West Indies; southern Mexico to Bolivia and Argentina.

- a. Pinnæ simple and entire to pinnatifid (rarely nearly pinnate at base of proximal pinnæ; basal segments (if any) adnate, never truly stalked) **A. auritum**
- a. Pinnæ (at least proximal ones) 1-pinnate to nearly 3-pinnate; basal segments (pinnules) of proximal pinnæ obviously free and stalked **A. cuspidatum**

Cajamarca: San Ignacio, San Juan de Piedra Bola, *Diaz* 2028 (F, MO). **Amazonas:** Kayamas Creek flowing into Río Cenepa, *Berlin* 463 (MO, US, USM). **San Martín:** Tarpoto, *Spruce* 3956 (BR), 4677 (US). **Loreto:** Río Mazán, *J. Schunke* 299 (F, GH, UC, US, USM). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Hacienda Mercedes, *Mexia* 8179 (F, GH, UC). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, Río Alberto, *León* 628 (USM). **Junín:** Prov. Tarma, Utcuyacu, *Woytkowski* 35363 (MO, UC). **Ucayali:** Prov. Coronel Portillo, Bosque von Humboldt, *Young & Salazar* 1026 (F, MO). **Ayacucho:** Ccarrapa, between Huanta and Río Apurímac, *Killip & Smith* 22369 (US), 22477 (US). **Cuzco:** Prov. Paucartambo, road from Pillawata to Patria, *Plowman & Davis* 4941 (F, GH, USM). **Madre de Dios:** Prov. Manú, Río Manú, Cocha Cashu Station, *Foster* 9703 (F, MO, USM). **Puno:** Prov. Carabaya, San Gabán, *Vargas* 18922 (GH).

53. **Asplenium salicifolium** L., Sp. pl. 1080. 1753. LECTOTYPE (designated by Morton & Lelinger, Mem. New York Bot. Gard. 15: 23. 1966): Plumier, *Traité foug. Amér.* 18, t. 60. 1705, based on a plant from the West Indies.

Plants terrestrial (often epiphytic outside Peru), the roots densely golden-tomentose. **Stem** erect, provided with clathrate, lanceolate to ovate-lanceolate scales, these 2–6 mm long, acute to attenuate, gray-brown, usually with long, orange cilia. **Leaves** 1-pinnate, subfasciculate, 30–80 cm long, 9–20 cm broad. **Petiole** 8–30 cm long, dull yellowish to reddish brown, not alate, sparsely scaly and often golden-tomentose at base. **Lamina** thin-

This and *A. cuspidatum* are part of a highly variable and widely distributed complex that is characterized within the genus by the fleshy, light green lamina that contrasts with the rich brown sori (the latter often confluent at maturity) and by the thick, fleshy, opaque indusia. Because of the variable dissection of the lamina (1-pinnate to 3-pinnate-pinnatifid) and the obtuse to subcaudate pinnæ, authors have separated the species complex into as many as a dozen taxa. However, individual specimens essentially differ only in pinna shape and degree of lamina dissection; thus, for purposes of this treatment, only *A. auritum* and *A. cuspidatum* (including three varieties) are recognized here. These are separated merely as a matter of convenience, by purely quantitative characters, as seen in the following key, and there are a number of intermediates even in these two components of the group.

to firm-herbaceous, lanceolate to deltate-ovate, abruptly reduced at apex to a broad-based, non-conform or subconform segment, not or scarcely reduced at base. **Rachis** dull yellowish or reddish brown, narrow-alate, lacking proliferous buds. **Pinnæ** 12–20 pairs, larger ones 4–10 cm long, 1.2–2.4 cm broad, subdistant to remote, narrowly acute to attenuate, inequilateral at base, commonly cordate and auriculate, the auricles often overlapping the rachis acroscopically, narrow-cuneate basiscopically, the margins obtusely crenulate to crenate or bicrenate. **Veins** distinct to obscure, 2-forked, at least in the proximal half of pinnæ. **Sori** linear or narrow-elliptic, inframedial. **Indusia** firm and fleshy, opaque, yellowish to light brown.

Dry woods or cloud forests, on the forest floor (but often on tree trunks and branches outside Peru), 2150–2700 m, Amazonas and Huánuco.

Southern Mexico; Nicaragua; Costa Rica; West Indies; Colombia to the Guianas, south to Peru and Brazil.

This, *A. auriculatum*, and *A. hastatum* have been combined by some authors. Their differences are merely quantitative, but they are maintained separately here pending revision of the group. Morton

and Lellinger (1966) and Stolze (1986) partially based their separation of the species on width of rachis wing, texture of lamina, or acroscopic pinna bases overlapping the rachis. None of these characters are consistent or significant, whereas length of stem scales, forking of veins, and shape of pinna and lamina apex are far more reliable, over the broad range of distribution.

Amazonas: Bongará, 4 km N of Pomacochas, *Knapp et al.* 7523 (F, MO). Prov. Chachapoyas, slopes of Pumaurcu SE of Chachapoyas, *Wurdack* 557 (F, GH, UC, US, USM). **Huánuco:** Muña, *Bryan* 528 (F). Cushi, trail to Tambo de Vaca, *Bryan* 618 (F). Huacachi, estación near Muña, *Macbride* 4107 (F, US).

54. *Asplenium hastatum* Kunze, *Linnaea* 23: 235, 305. 1850. LECTOTYPE (designated by Morton & Lellinger, *Mem. New York Bot. Gard.* 15: 21. 1966): Hort. Lips., originally from Venezuela (B!), photos F, US; isolectotype, B!).

Plants epiphytic or terrestrial, the roots densely golden-tomentose. **Stem** erect, provided with clathrate, linear-lanceolate, attenuate scales, these commonly 6–9 mm long, attenuate, gray-brown, usually with long, orange cilia. **Leaves** 1-pinnate, 30–80 cm long, 8–16 cm broad. **Petiole** 12–30 cm long, dull greenish to reddish brown, not or slightly alate, sparsely scaly and often golden-tomentose at base. **Lamina** firm-herbaceous to chartaceous, lance-ovate to oblong, abruptly reduced to a narrow, serrate-ligulate or subcaudate apex, not or scarcely reduced at base. **Rachis** dull reddish or greenish brown, alate, lacking proliferous buds. **Pinnae** 12–25 pairs, larger ones 6–9 cm long, 1–2 cm broad, subdistant to remote, commonly attenuate, inequilateral at base, truncate or subauriculate acroscopically, cuneate basiscopically, the margins obtusely but prominently serrate or biserrate. **Veins** indistinct or obscure, simple to once-forked. **Sori** linear or narrow-elliptic, medial to inframedial. **Indusia** firm to subcartilaginous, yellowish to brown.

Thus far known in Peru from one collection, on trees in mountains, San Martín.

Colombia; Venezuela; Ecuador; Peru.

The only collection seen from Peru perfectly matches the type specimens. The species seems to be intermediate between *A. auriculatum* and *A. salicifolium*, and all three could be synonymous.

San Martín: Cerros de Campana, *Spruce* 4676 (us).

55. *Asplenium auriculatum* Sw., *Kongl. Vetensk. Acad. Handl.* 1817: 64. 1817, not (Thunb.) Kuhn, 1868. TYPE: Brazil, Minas Gerais, *Freyreis* (holotype, presumably s; isotype, BM; photos, F & US of BM).

Plants epiphytic, sometimes terrestrial, rarely epipetric, the roots densely golden-tomentose. **Stem** erect, provided with clathrate, ovate to lanceolate scales, these 2–4(–5) mm long, acute, orange to light brown, usually with sparse, long, orange cilia. **Leaves** 1-pinnate, 12–30(–50) cm long, 3.5–9 cm broad. **Petiole** 4–15(–18) cm long, dull green, gray, or reddish brown, rarely atropurpureous, non-alate, sparsely scaly and often golden-tomentose at base. **Lamina** thin- to firm-herbaceous, lanceolate to oblong, abruptly reduced to a narrow, serrate-ligulate or subcaudate apex, not or scarcely reduced at base. **Rachis** dull reddish to greenish brown, marginate or narrow-alate, lacking proliferous buds. **Pinnae** 9–15 pairs, larger ones 3–6 cm long, 1–1.8 cm broad, approximate to subdistant, acute or subacute, inequilateral at base, truncate to subcordate and often overlapping the rachis acroscopically, cuneate to excavate basiscopically, the margins serrate or crenate-serrate. **Veins** simple or 1-forked, indistinct to obscure. **Sori** inframedial, linear or elliptic. **Indusia** firm, fleshy, opaque, yellow, green, or light brown.

In deep forests, commonly on tree trunks or branches, sometimes on wooded slopes or the forest floor, rarely on mossy rocks, 500–2700 m, Cajamarca and Amazonas to Cuzco and Madre de Dios.

Mexico to Panama; West Indies; Colombia to Trinidad, south to Bolivia and Brazil.

This is closely related to, and possibly synonymous with, *A. salicifolium* and *A. hastatum*. See treatment of the former for further discussion.

Cajamarca: Prov. Santa Cruz, ENE of Montesecco, *Santisteban & Guevara* 22 (F, GH, HUT, UC). **Amazonas:** Prov. Bagua, E of La Peca, *Barbour* 2492 (F, MO, UC). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, 4 km from Puerto Pizana, *Schunke* V. 4866 (F, US). **Huánuco:** Tingo María, *Stork & Horton* 9469 (F, GH, UC, US). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, Río San Alberto, *León* 629 (F). **Junín:** Chanchamayo Valley, *C. Schunke* 178 (F), 1369 (F). **Cuzco:** Quillabamba-Potrero, *Coronado* 119 (GH, UC, US). **Madre de Dios:** Prov. Manú, Atalaya, near Hacienda Amazonia, *Foster & Wachter* 7414 (F, MO).

56. *Asplenium cuneatum* Lam., *Encycl.* 2: 309. 1786. TYPE: Locality and collector undesig-

nated (holotype, P, *Herb. Jussieu 1125*; photo, US).

Plants epiphytic, rarely terrestrial, outside Peru sometimes epipetric. **Stem** stout, repent, provided with linear, attenuate, dark brown scales, these 2–4 mm long, 0.3 mm broad, lustrous, broadly and conspicuously clathrate. **Leaves** fasciculate, 2–3-pinnate, 15–35(–45) cm long, 4–12(–15) cm broad. **Petiole** 7–20 cm long, dull or sublustrous, reddish brown. **Lamina** chartaceous, subdeltate- to oblong-lanceolate, reduced to a pinnatifid apex, not or scarcely reduced at base, glabrous. **Rachis** dark reddish brown, glabrous, but this and the costae sparsely to moderately provided with dark, tortuous, filiform scales, essentially nonalate, lacking proliferous buds. **Pinnae** 12–25 pairs, approximate or subdistant, somewhat ascending, short-stalked, broad- or narrow-deltate. **Pinnules** 0.6–2 cm long, irregularly ovate to obovate, obtuse, lobed or with 1–2 pairs of segments, these obovate to subflabellate, broadly and obtusely dentate toward the apex. **Veins** indistinct, dichotomously branched, commonly forked. **Sori** 3–5 on the segments, borne at a very acute angle to the costule. **Indusia** light brown or yellowish, firm.

In dense forests, on trunks and branches of trees, rarely on forest floor, 100–900 m, San Martín and Loreto to Pasco, Puno.

West Indies; Guatemala to Costa Rica; Colombia to the Guianas; Ecuador; Peru; Brazil; Africa; Polynesia.

San Martín: Prov. Mariscal Cáceres, Dist. Uchiza, E of Nuevo Progreso, *Schunke V. 3195* (F, GH, US). Dist. Tocache Nuevo, Puerto Pizana, *Schunke V. 6946* (F, MO, UC). **Loreto:** Bank of Río Santiago, above Pongo de Manseriche, *Mexia 6222* (F, GH, MO, UC, US). **Huánuco:** Prov. Huánuco, Las Palmas, *Asplund 12635* (s). **Pasco** (as Junín): Puerto Bermúdez, *Killip & Smith 26518* (GH, US). **Puno:** Prov. Carabaya, Palmera, *Vargas 16161* (GH).

57. *Asplenium serra* Langsd. & Fisch., Icon. fil. 16, t. 19. 1810. TYPE: Brazil, Santa Catarina, *Langsdorff* (holotype, LE; isotype, B, *Herb. Willd.* 19880; photos, GH & US of B).

Asplenium serra var. *remotum* Kunze, Linnaea 9: 64. 1834. TYPE: Peru, Pampayacu, *Poeppig* in 1829 (holotype, LZ, destroyed).

Plants terrestrial, occasionally epiphytic or epipetric. **Stem** short- to long-creeping, abundantly provided with lanceolate, attenuate, brown or gray-

brown, iridescent, scales, these 3–5 mm long, conspicuously clathrate. **Leaves** 1-pinnate, approximate to remote, to 1 m long and 30 cm broad. **Petiole** to 50 cm long, dull or slightly lustrous, dark brown to atropurpureous, sparsely (rarely copiously) scaly. **Lamina** chartaceous (occasionally firm-herbaceous), oblong-lanceolate, terminating in a distinct, conform apical segment (this rarely with a basal lobe), not or scarcely reduced at base. **Rachis** nonalate, lacking proliferous buds. **Pinnae** 8–16 pairs, well spaced, spreading to ascending, stalked, long-attenuate, cuneate at base (often more broadly so acropically), margins serrate or biserrate (at least at apex). **Veins** 2–3-forked, ascending at very acute (mostly 10–20°) angles, often subparallel to the costa. **Sori** inframedial, not extending into the marginal 1/3 of the pinna. **Indusia** yellowish or brown, long and narrow, often obscured by the sporangia at maturity.

In forests, thickets, and edges of clearings, in Peru commonly on the forest floor, but occasionally low on tree trunks or among rocks, 100–3650 m, Cajamarca to Loreto, south to Ayacucho and Puno.

West Indies; Mexico to Panama; Colombia and Venezuela south to Argentina and Paraguay.

This species is commonly found as an epiphyte from Mexico to Ecuador, yet in Peru and the West Indies it is most often terrestrial. Also, the petiole and rachis commonly bear only a few, scattered, filiform scales, but several collections in Peru have rachises copiously beset with linear, often attenuate, clathrate scales, to 5 mm long: *C. Schunke 10, 137, and 655* (F) and *Killip & Smith 24615* (F, GH, US). Curiously, all plants were collected between 1927 and 1929 in Junín near Schunke's Hacienda, at about 1500 m. It is likely they come from the same site. Other than density of scales, they are typical *A. serra*.

Cajamarca: Prov. Cutervo, "Petroglifos de Llipa," *Mostacero et al. 1747* (F, GH, HUT, MO, UC). **Amazonas:** Prov. Chachapoyas, Calla-Calla slopes, near km 411–416 of Leimebamba–Balsas road, *Wurdack 1343* (F, GH). **San Martín:** Zepelacio, near Moyobamba, *Klug 3671* (F, GH, MO, US). **Loreto:** Mishuyacu, near Iquitos, *Klug 378* (F, US), *1509* (F, US). **Huánuco:** Prov. Huánuco, Mirador, road Acomayo to Chinchao, *Mexia 7758* (GH, MO, UC, US). **Pasco** (as Junín): Pichis Trail, Eneñas, *Killip & Smith 25649* (F, US). **Junín:** Schunke Hacienda, above San Ramón, *Killip & Smith 24615* (F, GH, US). **Ayacucho:** Prov. La Mar, between Tambo San Miguel, Ayna, and Hacienda Luisiana, *Dudley 11888* (GH). **Cuzco:** Prov. Paucartambo, Pillawata, *Vargas 16714* (GH). **Puno:** Churumayo, *Soukup 867* (F).

58. *Asplenium dimidiatum* Sw., Prodr. 129. 1788. TYPE: Jamaica, Swartz (holotype, s; isotypes, B, Herb. Willd. 19905, UPS, Herb. Thunb. 24798; photos, US of S, GH & US of B).

Plants terrestrial, rarely epiphytic or epipetric. **Stem** erect or short-decumbent, abundantly provided with narrowly clathrate, linear or filiform scales, these 5–8 mm long, with a tortuous, uncostate tip, dark brown to blackish, often with a fine, lighter brown margin. **Leaves** 1-pinnate, subcaespitose, 18–50 cm long, 6–12 cm broad. **Petiole** to 20 cm long, dull, dark brown to blackish, abundantly clathrate-scaly at base, usually less so distally. **Lamina** chartaceous or subcoriaceous, gradually reduced to a pinnatifid apex, or to a nonconform apical segment, not or scarcely reduced at base. **Rachis** nonalate, lacking proliferous buds, moderately to amply provided with narrow, attenuate, blackish, clathrate scales. **Pinnae** 6–12 pairs, well-spaced, sessile or subsessile, lanceolate, subdimidiate, lacking a costa, apex attenuate, inequilateral at base, cuneate acroscopically, excised basiscopically, margins serrate to deeply and irregularly erose-lacerate, abaxial surface and veins sparsely to moderately filiform-scaly. **Veins** repeatedly subdichotomous, subparallel or diverging from each other at 5–10° angles. **Sori** linear, crowded, at maturity usually covering pinnae nearly to margin. **Indusia** narrow, firm, light or yellow-brown, entire.

On forest floor or in moist ravines, rarely on rocks or bases of tree trunks, 650–2000 m, Amazonas, San Martín, Junín, Cuzco.

This has been confused with *A. erosum* L. of the Greater Antilles; however, pinnae of the latter are distinctly stalked and costate, and margins are more regularly and evenly serrate.

Amazonas: Prov. Bagua, canyon of Río Utcubamba on Chachapoyas road, *Hutchison and Wright 3793* (GH, UC). **San Martín:** Near Tarapoto, *Spruce 4753* (BR, GH, US). **Junín:** Prov. Tarma, Chanchamayo, *Esposito* (USM). Chanchamayo Valley, Puente Paucartambo to La Merced, *Gentry et al. 39823* (F, MO). La Merced, *Soukup 3407* (GH, US). **Cuzco:** Sahuayacu, *Bües 843* (US). Prov. La Convención, Río Apurímac, 20 min. float below Puerto Capiro, *Davis et al. 1291* (F, UC).

59. *Asplenium praemorsum* Sw., Prodr. 130. 1788. TYPE: Jamaica, Swartz (holotype, s; isotype, UPS, Herb. Thunb. 24834; photo, US of s).

Asplenium nigricans Kunze, Linnaea 9: 69. 1834. TYPE: Peru, Huánuco, Sierra de Huánuco, "ad

vicum Ambo," *Poeppig*, in Apr. 1830 (isotype, w; frag., BM; photos, BM, F & US of w).

Plants epipetric, epiphytic, or sometimes terrestrial. **Stem** erect or decumbent, abundantly provided with narrowly clathrate, linear to filiform scales, these 3–7 mm long, usually with a tortuous, uncostate tip, dark brown to blackish, sometimes with a fine, lighter brown margin. **Leaves** 1-pinnate-pinnatisect (in America), fasciculate, 12–60 cm long, 3–14 cm broad. **Petiole** somewhat shorter than the lamina, dull to slightly lustrous, dark brown to blackish, abundantly clathrate-scaly at base, usually less so distally. **Lamina** subcoriaceous, tapering to a pinnatifid apex, not or scarcely reduced at base. **Rachis** nonalate, lacking proliferous buds, moderately to copiously scaly as on the petiole. **Pinnae** 7–18 pairs, approximate or subdistant, sessile, or proximal ones very short-stalked, deeply lobed (or sometimes fully pinnate at base), the segments cuneiform to obovate, their apices often lacerate, abaxial surface and veins filiform scaly. **Veins** indistinct, subparallel or diverging from each other at a 5–10° angle. **Sori** linear, crowded. **Indusia** narrow, thin, light or yellow-brown, entire.

Common, in forests, usually on rocks and in crevices or rocky cliffs, often on trunks and branches of trees, or less frequently on the forest floor, 600–3700 m, Cajamarca to San Martín, south to Arequipa and Puno.

West Indies; Mexico to Panama; Venezuela and Colombia to Brazil and Bolivia; Argentina; Galapagos Islands.

This variable species has been recognized for a long time under a number of names, from such diverse areas as Jamaica, Arabia, and South Africa. Recently, Braithwaite (J. Linn. Soc., Bot. 93: 349. 1986) proposed that all, including *A. praemorsum*, should be included under the oldest name, *A. aethiopicum* (Burm.) Bech. African species have leaves no less than 2-pinnate, and two of the subspecies recognized by Braithwaite are 2-pinnate-pinnatifid. In the New World, and particularly in Peru, leaves are often only 1-pinnate-pinnatisect, with the division of pinnae sometimes confined to one or two basal lobes; so perhaps this taxon should be recognized as an American variety. An exhaustive study of the American representatives of this species complex, such as Braithwaite's in Africa, is needed before the problem is resolved. For purposes of this treatment, however, *A. praemorsum* is tentatively maintained as a distinct species.

Cajamarca: Proc. Contumazá, near Guzmango, *Sagástegui* 7703 (F, GH, MO). **Amazonas:** Prov. Chachapoyas, slopes of Caño Santa Lucía, *Wurdack* 732 (F, GH, UC). **La Libertad:** Prov. Trujillo, Cerro Campana, *Sagástegui* 6193 (GH, MO). **San Martín:** Dist. Huallaga, Valley of Río Ampsoncho, *Hamilton & Holligan* 940 (US). **Ancash:** Callejon de Huallas, 8 km SSE of Yungay, *Tryon & Tryon* 6548 (F, GH, US). **Huánuco:** Muña, *Macbride* 3931 (F, US). **Lima:** Prov. Canta, *Müller & López* 12905 (GH). **Junín:** Satipo, Pichanaki, rodal del Proyecto Peruano-Alemán, *León* 236 (F, UC). **Ayacucho:** Prov. La Mar, Ayna, *López & Soukup* 15089 (GH). **Apurímac:** Prov. Andahuaylas, W of Pincos, *Stork & Horton* 10714 (F, UC, US). **Cuzco:** Machu Picchu, *León* 461 (F, USM). **Arequipa:** Lomas de Arequipa, *Coronado* 32 (GH, UC, US). **Puno:** Prov. Carabaya, below Ollachea, *Vargas* 6906 (UC, US), 18991 (GH).

60. *Asplenium lividum* Kuhn, *Linnaea* 36: 100. 1869. TYPE: Venezuela, Aragua, Colonia To-var, *Fendler* 156 (holotype, B; isotypes, F!, MO, US; photo, US of B).

Plants terrestrial. **Stem** short-creeping, provided with ovate, narrowly clathrate scales, these 0.5–1 mm long, orange, acute to acuminate. **Leaves** 1-pinnate-pinnatisect, approximate, 25–45 cm long, 5–8 cm broad. **Petiole** somewhat shorter than the lamina, dull, reddish or grayish brown, non-alate, naked or with a few appressed scales like those on the stem. **Lamina** chartaceous, tapering to a pinnatifid apex, not or scarcely reduced at base. **Rachis** nonalate, lacking proliferous buds, this and the pinnae abaxially with scattered, appressed, acuminate scales to 1 mm long. **Pinnae** 14–20 pairs, larger ones 3–5 cm long, subdistant, short-stalked, pinnatisect (to nearly pinnate at base), the 3–6 pairs of segments linear to cuneiform, their apices often lacerate. **Veins** indistinct, subparallel or diverging from each other at 5–10° angles. **Sori** linear, crowded. **Indusia** narrow, thin, light or yellowish brown, entire.

Thus far known in Peru from one collection, in damp, shaded woods, about 2100 m, Huánuco. Venezuela; Peru; Africa.

This has been confused with *A. praemorsum*, as the two species are nearly identical in lamina architecture, texture, veins, and sori; yet they differ significantly in habit and indument. The stem of *A. lividum* is short-creeping, although sometimes not obviously so (in the manner of *A. laetum*), and bears only a few approximate leaves. Minute, orange, mostly ovate-acuminate, scales are clustered at the stem apex and also are sparsely scattered along the axes and veins abaxially. Laminar scales are only microscopically evident. In marked con-

trast are the erect (rarely decumbent) stem and densely fasciculate leaves of *A. praemorsum*, yet the latter differs even more conspicuously in the long, dark, filiform, usually copious scales that spread from the rachis, these quite evident to the naked eye.

Although dozens of specimens of *A. praemorsum* were examined during the course of this study, only the two sheets of *A. lividum* cited here have been found. However, Andean collections in various herbaria should be searched for the latter. Any specimen of *A. praemorsum* is suspect on which dark, spreading lamina scales are not macroscopically evident.

Huánuco: Muña, *Bryan* 417 (F, GH).

61. *Asplenium purdieanum* Hooker, *Icon. Pl.* 10: t. 938. 1854. TYPE: Colombia, Sierra de Santa Marta, La Fundación (erroneously reported by Hooker as Jamaica). *Purdie* (holotype, K; isotype, BM; frag., NY).

Plants epipetric or terrestrial. **Stem** stout, erect, provided with lanceolate, attenuate, gray-brown, iridescent scales, these 3–6 mm long, conspicuously clathrate. **Leaves** 1-pinnate, caespitose, to 50 cm long. **Petiole** to 25 cm long, reddish brown to blackish, dull or slightly lustrous, densely scaly as on the stem. **Lamina** thin- to firm-herbaceous, with 1–2 pairs of pinnae and a conform apical segment, or in juvenile leaves simple and cordate to sagittate. **Rachis** not or scarcely alate, moderately scaly. **Pinnae** sessile or short-stalked, elliptic or broadly lanceolate, acute to short-attenuate, cuneate at base, margins entire. **Veins** obscure or indistinct, anastomosing beyond the middle of the pinna to form elongate areoles, these lacking included veinlets. **Sori** in a single row on either side of the costa, spreading at acute angles. **Indusia** long and narrow, thin, often hyaline, shrivelling at maturity, the margin entire.

Rare throughout the range, thus far known in Peru from one collection in San Martín.

Elsewhere, in forests, on rocky soil or in crevices of limestone, 100–700 m, Honduras; Colombia; Venezuela; Peru.

This is easily distinguished from other species in the genus by the few pinnae and conform apical segment, the densely scaly petiole, and the anastomosing veins.

San Martín: Near Tarapoto, *Spruce* 4754 (BR, K).

62. *Asplenium theciferum* (HBK.) Mett., Ann. Sci. Nat. Bot. 2: 227. 1864. **Figure 1e.**

Davallia thecifera HBK., Nov. Gen. Sp. 1: 23. 1815.
TYPE: Venezuela, in monte Saraquen, *Humboldt & Bonpland* (holotype, P).

Loxoscaphe thecifera (HBK.) Moore, Index fil. 302. 1861.

Plants epiphytic, occasionally epipetric. **Stem** erect or decumbent, provided with ovate to lanceolate, bicolorous scales, these 2–3 mm long, gray-brown to blackish, with narrow lighter brown margins. **Leaves** 2-pinnate to 2-pinnate-pinnatifid, fasciculate, 7–25 cm long. **Petiole** as long as or slightly longer than the lamina, stout and fleshy, dull greenish to yellowish, moderately to sparsely provided with dark, conspicuously clathrate scales similar to those of the stem. **Lamina** subcoriaceous, deltate- to elliptic-ovate, tapering to a pinnatifid apex. **Rachis** greenish, not or slightly alate, inconspicuously scaly. **Pinnae** 5–8 pairs, stalked, divided into linear to clavate segments or pinules, these sometimes incised deeply into tertiary segments. **Veins** completely obscured within the thickened tissue. **Indusia** cuplike or pocketlike, borne singly along the acroscopic side of ultimate segments, near their tips, with sporangia deeply immersed.

Known thus far in Peru from a single specimen from Cuzco, 900 m (cited below).

Hispaniola; southern Mexico; Costa Rica; Panama; Colombia; Venezuela; Ecuador; Peru.

Cuzco: Mercedes, *Bües* 1736 (US).

Comments

Asplenium denudatum Kuhn, *Linnaea* 36: 93. 1869.

TYPE: “Andes Peruvianae” (collector undesignated, B?).

This was originally described by Mettenius, but not published until Kuhn’s emendation of it in 1869. Judging from Kuhn’s detailed description, it is probably *A. monanthes*. Stem scales are said to be concolorous, reddish brown, and clathrate, the lamina 6 in. long, and petioles lustrous and castaneous, so it is likely to be var. *castaneum*. Positive identification awaits study of the type.

Asplenium discolor Kunze, *Linnaea* 9: 65. 1835.

Kunze identified a collection by Poeppig as

this species (“Peru, on the upper Huallaga, near Mission Tocache, *Poeppig*, July, 1830”).

A search of several herbaria (B, BM, K, P, W) proved fruitless, and the original description is too incomplete to assign specimens to this name. The species was said to be a foot long, with petiole 4 in. long, rachis subulate, purplish and puberulent, and pinnae remote and obtusely serrate. These characters are common to many species of *Asplenium*.

Asplenium otites Link, Fil. spec. 2: 60. 1833. TYPE:

Cultivated, presumably from a South American plant (Link, in Fil. spec. 91. 1841, cited “*Brasilia*”), *Hort. Mus. Bot. Berol.*, Cat. No. 053514 (holotype, B!; photos, F, US).

It is difficult to place this name, because the type is similar to several other South American species, yet the specimen is too incomplete for definite comparison. It consists only of a single lamina with 6 cm of petiole, it lacks a stem, and the lamina is broken off near the tip. It has been compared to *A. pulchellum*, but its pinnae are inequilateral only at the base and bear 6–8 pairs of veins, which are mostly forked acroscopically. Pinnae of the latter are inequilateral throughout the proximal half, and veins are fewer and unbranched above the pinna base. It is probably more closely related to *A. drepanophyllum*, which does have more numerous and forked veins, but the latter has twice the number of pinnae and the lamina is more attenuate. The question is not likely to be resolved with certainty.

Asplenium trapezoides Sw., Syn. fil. 76. 1806.

TYPE: Peru (Junín), Tarma, *Lagasca* (holotype, S; isotypes, B, *Herb. Willd.* 19869, P; photos, F & GH of B).

The locality cited is undoubtedly incorrect. It certainly should be Chile, because the specimen is clearly the Chilean species *A. trilobum* Cav., and the Willdenow Herbarium sheet was so identified by Hieronymus. This rare fern has not been reported outside Chile for nearly 200 years, since the original citation of the type of *A. trapezoides*. The fasciculate leaves are subtrapezoidal, deeply crenate or with a pair of basal lobes. They lack a distinct midrib, and veins are flabellately branched from the lamina base. Admittedly, this is a small and inconspicuous fern, but its leaf shape is curious and distinctive, and if it is indeed in Peru it certainly should have been rediscovered by now.

Asplenium weberbaueri Hieron., Hedwigia 60: 211. 1918. TYPE: Peru (Puno), Tambo Isillum, on the way from Sandia to Chanchasmayo, *Weberbauer 1198* (b?).

This plant was described as having simple, linear leaves to 16 cm long and 1.5 cm broad that taper gradually at both ends, serrate or dentate margins, short (4 cm) petioles, veins spreading at 20–25° angles, and elongate-deltate stem scales. In characters of leaf size and shape, it is similar to *Asplenium angustum*, but in lamina margin and stem scales it seems nearer to *A. serratum*. In Hieronymus's discussion, he refers to hook-shaped spines (stiff scales?) along the midrib. Both the above-named species have dark scales along the midrib, but these cannot be termed "hook-shaped." A canvass of European herbaria failed to locate the type, so the name cannot be precisely placed at this time.

Family 19. DAVALLIACEAE

Davalliaceae Frank, Syn. Pflanzensk. (Leunis), ed. 2, 3: 1474. 1877. TYPE: *Davallia* Sm.

Nephrolepidaceae Pic.-Ser., Webbia 29: 8. 1974. TYPE: *Nephrolepis* Schott.

Stem erect, decumbent, or long-creeping, moderately stout to slender, more or less indurated, bearing scales. **Leaves** ca. 15 cm to 3 m long, entire to usually pinnate, circinate in veneration, petiole without stipules. **Sori** roundish to somewhat elongate, rarely linear, abaxial, near or back of the margin, or on an intramarginal commissure, usually not paraphysate, usually indusiate. **Sporangium** with a 2-rowed stalk below its apex, with a usually long stalk, the vertical annulus interrupted by the stalk.

The Davalliaceae are a family of about 10 or fewer genera of the Old World, with *Nephrolepis* also in America. Most species are epiphytes with a dorsiventral stele and leaves that are articulate near the base of the petiole.

Nephrolepis, the only genus in America, is included in the family with some uncertainty. The tuberculate spores and staurocytic stomata suggest a closer alliance with the davallioid ferns than with other groups.

I. Nephrolepis

Nephrolepis Schott, Gen. fil. no. 3. 1834. TYPE: *Nephrolepis exaltata* (L.) Schott (*Polypodium exaltatum* L.). **Figure 2.**

Stem erect or decumbent, bearing scales, freely stoloniferous. **Leaves** monomorphic or slightly dimorphic with the fertile pinnae narrower than the sterile. **Lamina** 1-pinnate, the pinnae articulate, entire or nearly so, glabrous, pubescent, and (or) scaly, the scales usually dissected, with hydathodes adaxially that usually have a thin, whitish, circular secretion, veins free. **Sori** roundish to lunate, borne on the vein ends, not paraphysate, covered by an orbicular to lunate indusium. **Spores** ellipsoidal, monolete, the surface irregularly tuberculate to rugose.

Nephrolepis is a tropical and subtropical genus of perhaps 20 species, with five native species in America and four in Peru.

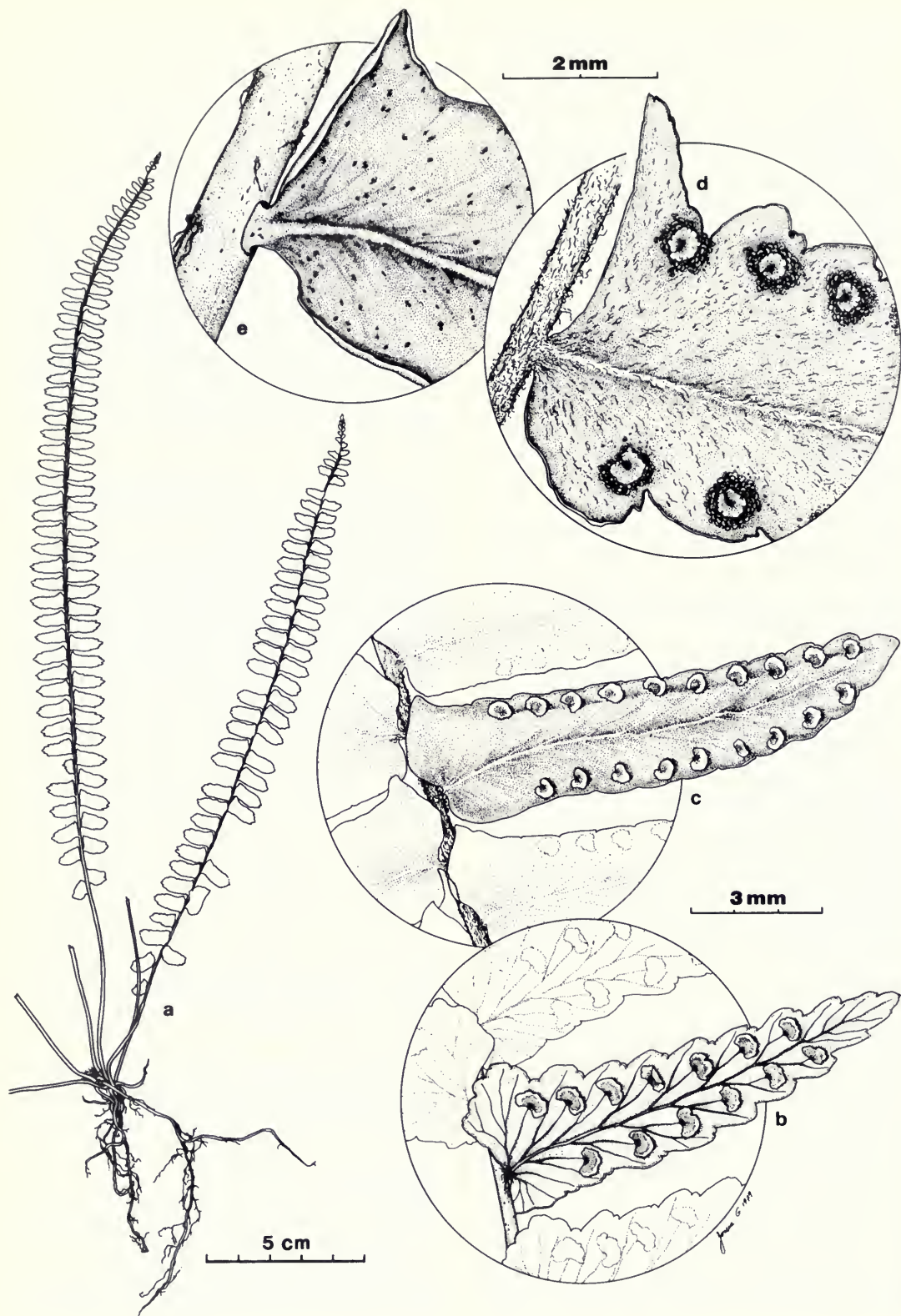
The species of *Nephrolepis* are not well understood and, accordingly, current accounts of the genus in tropical America and other tropical regions often differ in the application of names and in the primary characters employed for identification. The following treatment is based primarily on Peruvian materials, and differences with other modern treatments do not necessarily imply alterations in the taxonomy of American species in other regions.

Several species and their cultivated variations are commonly maintained in gardens and may escape to more or less native habitats, either through spore dispersal or by the growth of discarded cultivated plants. Some of the many cultivated variations (cultivars) have rarely been collected in Peru. These usually have pinnatifid to several times pinnate pinnae, forked pinnae or rachises, or nearly orbicular pinnae. They are not included in the treatment of the native and adventive species.

The key to species emphasizes the primary characters of the species, while uncommon variations are mostly mentioned in the descriptions.

References

- NAUMAN, C. E. 1981. The genus *Nephrolepis* in Florida. Amer. Fern J., 71: 35–40.
SMITH, A. R. 1981. *Nephrolepis*, pp. 151–154. In *Flora of Chiapas*, part 2, Pteridophytes.



TRYON, R. M., AND A. F. TRYON. 1982. *Ne-*

Key to Species of *Nephrolepis*

1. Indusium orbicular to orbicular-reniform, with a narrow to rather open sinus; mature sporangia projecting all around the indusium b
 - b. Pinnae short- or very short-stalked; costa definitely pubescent adaxially, or if glabrous then the base of the pinnae equilateral or nearly so c
 - c. Base of the pinnae equilateral or nearly so, sometimes biauriculate, or slightly and broadly auriculate only on the acroscopic side; costa adaxially with long, often flexuous, trichomes and usually some dissected scales; stem scales light brown to brown, more or less spreading 1. *N. biserrata*
 - c. Base of the pinnae, or most of them, inequilateral, the acroscopic side narrowly auriculate; costa adaxially with short to rarely moderately long, stiff trichomes; stem scales dark brown to blackish, appressed 2. *N. multiflora*
 - b. Pinnae sessile; costa glabrous or nearly so adaxially; base of the pinnae inequilateral, the acroscopic side broadly and acutely to subacutely auriculate 3. *N. rivularis*
- a. Indusium reniform, with a broad sinus, to lunate; mature sporangia projecting from the free portion of the indusium d
 - d. Fertile pinnae with the basal sorus on the acroscopic side and the basal sorus on the basiscopic side ca. equally distant from, or close to, the base of the pinna, or many of them so; the distal pinnae, but not necessarily the apical ones, rounded, usually broadly so, at the base on the basiscopic side 4. *N. cordifolia*
 - d. Fertile pinnae with the basal sorus on the acroscopic side much closer to the base of the pinna than the basal sorus on the basiscopic side, or most of them so; especially the distal pinnae cuneate at the base on the basiscopic side to sometimes slightly rounded 5. *N. pectinata*

1. *Nephrolepis biserrata* (Sw.) Schott, Gen. fil. no. 3. 1834.

Aspidium biserratum Sw., J. Bot. (Schrader) 1800(2): 32. 1802. TYPE: Mauritius, Gröndahl (Gröndal) (holotype, Herb. Sw., s!).

Tectaria fraxinea Cav., Descr. pl. 250. 1802. TYPE: Peru. Obregillo, Née, MA, seen by C. Chr. (Dansk Bot. Ark. 9(3): 15. 1937 and referred here).

Stem scales light brown to brown, more or less spreading. **Pinnae** short-stalked, pubescent to rarely glabrous abaxially, the costa pubescent adaxially with long, often flexuous, trichomes and usually some dissected scales, rarely the trichomes short or the costa glabrous, the base equilateral or nearly so, sometimes biauriculate, or slightly and broadly auriculate only on the acroscopic side, broadly rounded to broadly cuneate on the basiscopic side. **Lamina** of fertile leaves ca. 10–30 cm broad. **Basal**

sori on the acroscopic and basiscopic sides equally close to the base of the pinna. **Indusium** orbicular, with a narrow sinus, the mature sporangia projecting all around the indusium.

Epiphytic or usually terrestrial, along roadsides, in secondary growth, along forest borders, and in tall forests, 100–900 m, Cajamarca and Amazonas to Ayacucho.

Tropical America; Old World.

The lamina of this species is usually considerably broader than that of other Peruvian species. Even in rather small leaves it is rarely less than 10 cm broad, and in large leaves, which may be up to ca. 3 m long, it is commonly 30 cm broad or more. Small plants may have leaves similar to those of *N. multiflora* but that species has the pinnae inequilateral at the base, dark, appressed stem

FIG. 2. *Nephrolepis pectinata*: a, habit; b, fertile pinna. *Nephrolepis cordifolia*: c, fertile pinna. *Nephrolepis multiflora*: d, pinna base. *Nephrolepis rivularis*: e, pinna base. (Adapted from Stolze, Ferns and Fern Allies of Guatemala, 1981.)

scales, and usually has the pinnae abaxially fibrillose-scaly, especially at the base.

Cajamarca: Prov. Jaén, Quebrada Tabaconas, *Ferreira & Sánchez* 19646 (USM). **Amazonas:** Prov. Bagua, Chirico-Puente Venezuela, *Barbour* 4331 (MO). La Poza, Río Santiago, *Berlin* 3701 (MO). **San Martín:** NW of San Martín, *Soukup* 5218 (GH). Prov. San Martín, Vaca Pozo, *Woytkowski* 35136 (MO). Prov. San Martín, Ekin, *Woytkowski* 35230 (MO, UC). **Loreto:** Prov. Maynas, Río Itaya, *Tryon & Tryon* 5176 (BM, F, GH, US, USM). Prov. Maynas, 3 km S of Iquitos, *Tryon & Tryon* 5163 (BM, F, GH, U, US, USM). **Huánuco:** Prov. Pachitea, Bosque Nacional de Iparia, *J. Schunke* V. 1735 (F, GH, US). **Ayacucho:** Kimpiriki, Río Apurímac, *Killip & Smith* 22856 (F, US).

2. *Nephrolepis multiflora* (Roxb.) Morton, Contr. U.S. Natl. Herb. 38: 309. 1974. **Figure 2d.**

Davallia multiflora Roxb., Calcutta J. Nat. Hist. 4: 515, t. 31 (left), 1844. LECTOTYPE: by Morton, loc. cit., India, *Roxburgh* (BR; frag. and photo, US).

Stem scales dark brown to blackish, appressed. **Pinnae** short- or very short-stalked, fibrillose-scaly abaxially, especially toward the base and (or) pubescent, the costa adaxially with usually short and stiff, to moderately long, trichomes, rarely with some dissected scales or long trichomes, the base inequilateral, narrow auriculate on the acroscopic side, broadly rounded to slightly auriculate on the basiscopic side. **Lamina** of fertile leaves ca. 8–20 cm broad. **Basal sori** on the acroscopic and basiscopic sides equally close to the base of the pinna. **Indusium** orbicular to orbicular-reniform, with a narrow to rather open sinus, the mature sporangia projecting all around the indusium.

Terrestrial, in primary forests and also disturbed areas, 120–2100 m, Cajamarca and Loreto.

Paleotropics; sporadically adventive in tropical America.

This species is probably more frequent in Peru than the few collections indicate. It is distinguished by the abaxially fibrillose-scaly pinnae and the stem scales that are dark and appressed. It has perhaps been confused with another paleotropical species, *Nephrolepis hirsutula* (Forster) Presl, which has the adaxial side of the costa moderately to densely invested with dissected scales, rather than pubescent as in *N. multiflora*. The species *N. hirsutula* is not known to be adventive in Peru.

Cajamarca: Provicutervo, San Andres, *Quiroz* 2840 (F). **Loreto:** Prov. Maynas, Puerto Almendras, *Vásquez & Jaramillo* 1415 (MO). Prov. Maynas, Quistococha,

Vásquez & Jaramillo 4079 (F). Iquitos, *Müller & Müller* 2508 (GH). Quistococha, *Gentry & Ayala* 15531 (US).

3. *Nephrolepis rivularis* (Vahl) Krug, Bot. Jahrb. Syst. 24: 122. 1897.

Polypodium rivulare Vahl, Eclog. amer. 3: 51. 1807. TYPE: West Indies, Montserrat, *Ryan* (holotype, C).

Stem scales light to dark brown, appressed to spreading. **Pinnae** sessile, glabrous to slightly pubescent abaxially, and (or) with a few dissected scales, rarely minutely pubescent, the costa glabrous or nearly so adaxially, the base inequilateral, broadly acutely or subacutely auriculate on the acroscopic side, cuneate to rounded on the basiscopic side. **Lamina** of fertile leaves ca. 8–15 cm broad. **Basal sori** on the acroscopic and basiscopic sides ca. equally close to the base of the pinna, or closer on one side than the other. **Indusium** orbicular, with a narrow sinus, the mature sporangia projecting all around the indusium.

Epiphytic, or usually terrestrial, in disturbed vegetation, secondary forests, or primary forests, 100–900 m, San Martín to Puno.

Tropical America.

This is a distinctive species, especially in its character of sessile pinnae. Contrary to some authors, it appears that the combination *Nephrolepis rivularis* was validly published by Krug, although the basionym was not cited.

San Martín: Soritor, *Woytkowski* 6246 (GH, US). **Loreto:** Gamitanacocha, Río Mazán, *Schunke* 219 (GH, UC). Prov. Maynas, Río Nanay, *McDaniel* 13685 (GH), *Hickok* 662 (GH). Quista Cocha (Quistococha), near Iquitos, *McDaniel* 11739 (GH). **Pasco:** Prov. Oxapampa, Palcazú valley, *Foster* 9503 (MO). **Cuzco:** Prov. Paucartambo, Kosñipata-Pilcopata, *Vargas* 14750 (GH). **Madre de Dios:** Prov. Tambopata, Tambopata Nature Reserve, *Barbour* 4783 (MO), 5124 (F, MO). **Puno:** San Gavan (Gabán), *Lechler* 2515 (GH, K).

4. *Nephrolepis cordifolia* (L.) Presl, Tent. Pterid. 79. 1836. **Figure 2c.**

Polypodium cordifolium L. Sp. pl. 2: 1089. 1753. TYPE: Petiver, Pteri-graphia amer., t. 1, f. 11 (not seen in Petiver, Hort. Sicc. in Herb. Sloane, BM). *Aspidium pendulum* Raddi, Opusc. Sci 3: 289. 1819. TYPE: Brazil, *Raddi* (holotype, F; isotype, K). *Nephrolepis pendula* (Raddi) J. Sm., J. Bot. (Hooker) 4: 197. 1841.

Stem scales light to dark brown to blackish, more or less appressed. **Pinnae** short- to very short-stalked, essentially glabrous, the costa essentially glabrous adaxially, the base inequilateral or somewhat inequilateral, slightly to definitely auriculate on the acroscopic side, rounded to broadly rounded or sometimes slightly auriculate on the basiscopic side. **Lamina** of fertile leaves ca. 3–10 cm broad. **Basal sorus** on the acroscopic and basiscopic sides ca. equally distant from, or close to, the base of the pinna, or most of them so. **Indusium** reniform, with a broad sinus, to lunate, mature sporangia projecting from the free portion of the indusium.

Epiphytic, rupestral, or terrestrial, rocky places, rarely on cliffs, cloud forests, forest borders, primary forests, shrubby hillsides, or on fallen trunks and branches, 125–2800 m, Cajamarca and Amazonas south to Puno.

Tropical America; Old World.

The Petiver illustration is not adequate for the purposes of accurate identification. It is said to be copied from Plumier, *Traité foug. amér.*, t. 71, from Hispaniola, which is more clearly, and usually identified as, *Nephrolepis cordifolia*.

Some epiphytic plants have very long, pendent leaves, up to 3 m and perhaps longer. However, in comparison to the long leaves of *Nephrolepis biserrata*, the lamina of those of *N. cordifolia* is narrow, about 8–10 cm broad. Sometimes there is a single basal basiscopic sorus closer to the base of the pinna than the basal basiscopic sorus.

At times, *Nephrolepis pendula* is adopted for this species because its application is certain. At other times, *N. pendula* is considered to be a separate species from *N. cordifolia*. At least in Peru the two do not seem to be separable since there are intermediate specimens.

This and the following species *Nephrolepis pectinata* are the most widely distributed and common species of the genus in Peru. A discussion of the differences between them is provided under *N. pectinata*.

Cajamarca: Prov. Santa Cruz, Bosque de Monteseco, *Sagástegui et al.* 12402 (F, MO). Prov. Cutervo, Cutervo-Sócota, *López et al.* 5316 (GH). **Amazonas:** Prov. Bongará, Laguna Pomacocha, *Wurdack* 883 (GH, US). Prov. Chachapoyas, entre Chachapoyas y Cáclis, *López et al.* 4350 (GH, MO). **San Martín:** Zepelacio, near Moyobamba, *Klug* 3736 (F, GH, US). Prov. Mariscal Cáceres, Distrito Tocache Nuevo, *J. Schunke V.* 4337 (F, GH, US). **Loreto:** Above Pongo de Manserische, *Mexia* 6163 (F, GH, UC, US). **Huánuco:** Prov. Pachitea, Bosque Nacional de Iparia, *J. Schunke V.* 2940 (F, GH, US). Hacienda Paty,

abajo de Carpish, *Ferreya* 9353 (GH, USM). **Pasco:** Prov. Oxapampa, Oxapampa-Cerro de Pasco, *D. Smith* 4083 (GH). Prov. Oxapampa, N of Chequitavo, *D. Smith* 5108 (GH). **Junín:** Huacapistana, *Tryon & Tryon* 5452 (BM, F, GH, U, US, USM). **Ucayali:** Prov. Coronel Portillo, Boquerón del Padre Abad, *Ridoutt* (GH, USM). **Ayacucho:** Prov. La Mar, eastern massif of the Cordillera Central, *Dudley* 11724 (GH), 11880 (GH, US). **Cuzco:** Prov. La Convención, Río Apurímac, *Davis et al.* 1328 (F, GH). Prov. Urubamba, Macchu Picchu station, *Saunders* 1230 (F, GH). **Puno:** Prov. Sandia, Asalaya, *Vargas* 1483 (F).

5. *Nephrolepis pectinata* (Willd.) Schott, Gen. fil. no. 3. 1834.

Aspidium pectinatum Willd., Sp. pl. 5: 223. 1810.

TYPE: "ex Aiton" (holotype, *Herb. Willd.* 19753, B!; photo, GH). **Figures 2a–b.**

Stem scales brown to blackish, more or less appressed. **Pinnae** sessile to usually short-stalked, essentially glabrous abaxially, or rarely minutely pubescent, the costa essentially glabrous adaxially, to rarely partly minutely pubescent, the base inequilateral, auriculate on the acroscopic side, especially the distal pinnae cuneate to slightly rounded on the basiscopic side. **Lamina** of fertile leaves ca. 2–4 cm broad. **Basal sorus** on the acroscopic side much closer to the base of the pinna than the basal sorus on the basiscopic side. **Indusium** reniform, with a broad sinus, to lunate, mature sporangia projecting from the free portion of the indusium.

Epiphytic, rupestral, or terrestrial, rocky places in woods, in primary forests, cloud forests, on stream banks, forest borders, in moist and rough pastures, on fallen trunks and branches, 200–2900 m, Cajamarca and Amazonas to Puno.

Tropical America.

Nephrolepis pectinata is distinguished by having, especially in the distal portion of the lamina, the pinnae with a cuneate (evenly tapering) base on the basiscopic side and having the basal sorus on the acroscopic side much closer to the base of the pinna than the basal sorus on the basiscopic side. Sometimes *N. pectinata* has the base of the pinna on the basiscopic side slightly rounded, and *N. cordifolia* may have a single basal acroscopic sorus closer to the base of the pinna than the basal basiscopic sorus.

Nephrolepis occidentalis Kunze (Linnaea 18: 343. 1844) is usually recognized as a species, with a poorly developed stem and thin, long-triangular, crenate to shallowly lobed pinnae with the veins clearly evident abaxially. However, at least in South

America, there is intergradation between specimens with the characters of *N. occidentalis* and those of *N. pectinata* and it is not possible to recognize the former as a distinct species in that continent. Plants referred to *N. occidentalis* usually grow in especially damp and shaded situations, and they may represent an ecological variation (shade form) or an ecotype of *N. pectinata*.

Cajamarca: Prov. Santa Cruz, Monteseco, *Sagástegui et al.* 12402 (HUT). **Amazonas:** Prov. Bagua, Chiriaco to Puente Venezuela, *Barbour* 4401 (MO). **San Martín:** Prov. Lamas, Lamas, *Belshaw* 3441 (F, GH). **Loreto:** Above Pongo de Manserische, *Mexia* 6219 (F, GH, UC, US). Pucallpa, between Balsapuerto and Moyobamba, *Klug* 3246 (F, GH, US). **Huánuco:** Muña, *Bryan* 415 (F, GH). Prov. Huánuco, above Cayumba, Río Huallaga, *Mexia* 8324 (F, GH, UC, US). Prov. Huánuco, Hacienda Exito, *Mexia* 8135 (F, GH, UC, US). **Pasco:** Prov. Oxapampa, between Oxapampa and Paucartambo, *Smith & Pretel* 1485 (F, GH). **Junín:** Prov. Satipo, S of Chequitavo, *D. Smith* 5154 (GH). Above San Ramón, *Killip & Smith* 24613 (F, GH, US). **Ucayali:** Prov. Coronel Portillo, La Divisoria (as Loreto), *Dillon* 2630 (F, MO). Prov. Coronel Portillo, Boquerón del Padre Abad, *Ferreira* 8109 (GH), 8129 (GH). **Cuzco:** Prov. Quispicanchi, San Pedro, *Vargas* 9748 (GH). Prov. La Convención, *Dudley* 10432 (GH). **Madre de Dios:** Manú, Atalaya, *Foster & Wachter* 7415 (MO). **Puno:** Prov. Carabaya, Hacienda Palmera, *Vargas* 16123 (GH).

Comments

Nephrolepis hirsutula (Forst.) Presl, Tent. Pterid. 79. 1836.

Polypodium hirsutulum Forst. Prod. 81. 1786. TYPE: South Sea Islands, probably Tahiti, *Forster*, photo, US of BM (see Morton, Contr. U.S. Natl. Herb. 38: 345. 1974).

This species is native in the Malaysian and Pa-

cific regions and is sparingly adventive in the American tropics. It may be collected in Peru. It is similar to *N. biserrata* but the adaxial surface of the costa bears dissected scales and lacks trichomes; also, a single, prominent, basal auricle is usually on the acroscopic side of the pinnae.

Family 20. BLECHNACEAE

Blechnaceae (Presl) Copel., Gen. fil. 155. 1947.

Blechnae Presl, Epim. bot. 103. 1851, as *Blechnaceae*. TYPE: *Blechnum* L.

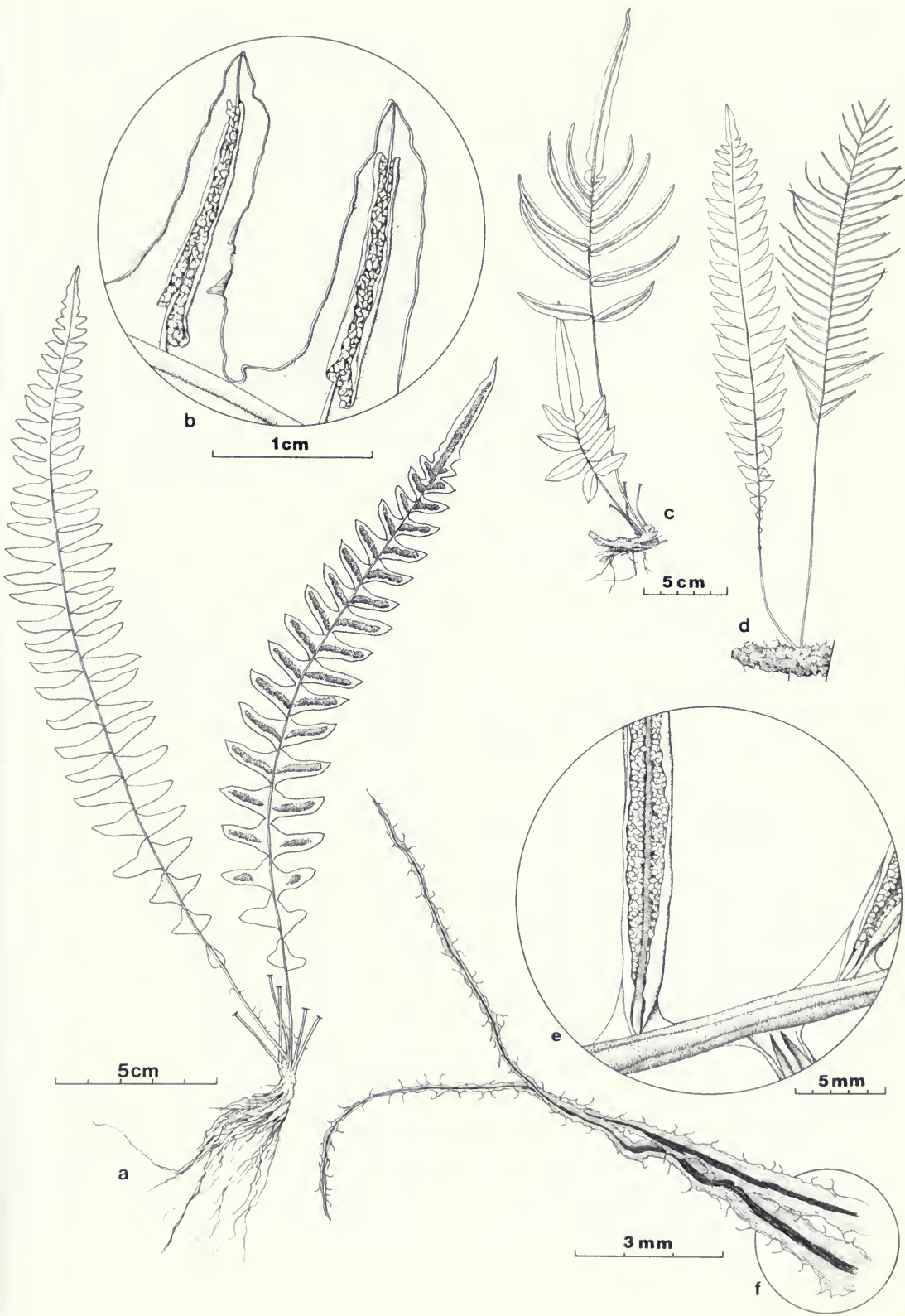
Stem erect and slender to very thick, to decumbent and small to stout, or long-creeping, or scandent, hardly sclerotic to strongly indurated, bearing scales. **Leaves** ca. 10 cm to 15 m long, circinate in veneration, monomorphic to dimorphic, the lamina entire to usually pinnatisect or 1–2-pinnate, glabrous, minutely glandular, pubescent, or scaly abaxially. **Petiole** lacking stipules, not articulate to the stem. **Veins** wholly free or partly anastomosing. **Sori** abaxial, short to very long, borne on a vein (or sometimes the sporangia also borne on the leaf-tissue), usually covered by an indusium that opens on the side of the axis at the segment or exindusiate, not paraphysate. **Sporangia** with a 2–3-rowed stalk and a vertical or nearly vertical annulus, which is usually interrupted by the stalk.

The *Blechnaceae* are a family of nine genera and about 175 species. There are two genera and 20 species in Peru. The spores are monolete, and the young leaves are usually tinged with red.

Key to Genera of *Blechnaceae*

- a. Leaf to ca. 2 m long, determinate; lamina entire to 1-pinnate I. *Blechnum*
- a. Leaf climbing to 15 m or more, indeterminate; lamina 2-pinnate II. *Salpichlaena*

FIG. 3. *Blechnum asplenioides*: a, habit; b, fertile pinnae. *Blechnum fraxineum*: c, habit. *Blechnum binervatum* ssp. *fragile*: d, habit; e, portion of rachis with pinna base; f, stem scales. (Adapted from Stolze, Ferns and Fern Allies of Guatemala, 1981.)



I. *Blechnum*

Blechnum L., Sp. pl. 1077. 1753; Gen. pl. ed. 5, 485, 1754. TYPE: *Blechnum occidentale* L. (as *B. orientale*). **Figure 3.**

Lomaria Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 3: 160. 1809. TYPE: *Lomaria nuda* (Labill.) Willd. = *Blechnum nudum* (Labill.) Luers.

Terrestrial, rupestral, or sometimes epiphytic, or scandent-epiphytic. **Stem** decumbent, or long-creeping, or scandent, or erect and small to massive, often producing stolons. **Leaves** monomorphic to dimorphic and the fertile usually longer than the sterile and with narrower segments. **Lamina** entire or usually pinnatisect to 1-pinnate. **Veins** free or rarely partly anastomosing and without included veinlets. **Sori** short to long, on a vascular commissure close to the costa, not paraphysate, covered by an indusium of similar extent that opens toward the costa. **Spores** ellipsoidal, monolet, nearly smooth, slightly papillate, rugose, reticulate, or echinate.

Blechnum is a nearly worldwide genus of perhaps 150 species, 19 of them in Peru. Although infrageneric classifications are sometimes presented (Smith, 1985), there is uncertainty concerning the relations of several species, and only two subgenera are mentioned here: subgenus *Blechnum* (species 1–7), with expanded green tissue beyond the attachment of the indusium and with monomorphic leaves, and subgenus *Lomaria* (Willd.) C. Chr. (Index fil. 150, 401. 1905) (species 8–19), with little or no green tissue beyond the attachment of the indusium and with usually dimorphic leaves.

Species of *Blechnum* are often poorly defined, due in part to genetic and phenotypic variation and also to hybridization. Walker (1985) reports two hybrids in subgenus *Blechnum* and suggests that these probably represent but a few of those that occur in nature. For the purposes of identification of the hybrid (*Blechnum* × *caudatum* (3×) *B. fraxineum* (2×) × *occidentale* (4×) is placed under *B. occidentale*, and the hybrid *B. asplenoides* × *fraxineum* (4×) is treated under *B. confluens*. Much more cytological data are needed before the taxonomy of the Andean *Blechnum occidentale* complex (species 1–5) is adequately

known. Walker (1985) and Mickel and Beitel (1988) discuss the characters of hybrids in this complex.

Various characters, sometimes employed as species distinctions, have been found to be too variable in Peru to merit their use—for example, the presence or absence of aerophores on the lamina (at the base of the pinnae abaxially) or the shape of the aerophores, and pubescence and glandularity of the lamina.

In this treatment, a pinna is considered to be a stalked or sessile segment or an adnate one that is longer than broad. A lobe is considered to be a reduced segment that is adnate and broader than long. While this treatment is centered on the species of Peru, it includes an assessment of all South American *Blechnum* materials. However, species tend to be more variable in the Andes than to the north, and we do not wish to imply that other species of Mexico, Central America, and the West Indies are not probably recognized.

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Key to Species of *Blechnum*

- a. Fertile segments with expanded green tissue beyond the attachment of the indusium; leaves monomorphic, the sterile segments with essentially flat margins b
 - b. Lamina entire, rarely with 1 or 2 small pinnae or lobes at the base 5. **B. lanceola**
 - b. Lamina pinnatifid to 1-pinnate c
 - c. Lamina 1-pinnate; pinnae with the short stalk articulate to the rachis 6. **B. serrulatum**
 - c. Lamina often pinnatifid, pinnae of a 1-pinnate lamina with the stalk continuous with the rachis d
 - d. Lamina with the apex abruptly reduced to an apical segment that is longer than the longest pinna 3. **B. fraxineum**
 - d. Lamina with the apex gradually reduced, the apex pinnatifid or with an entire tip that is usually shorter than the longest pinna e
 - e. Lamina usually not or only slightly reduced at the base; basal pinnae truncate or semi-cordate to cordate, not fully adnate to the rachis 1. **B. occidentale**
 - e. Lamina reduced at the base; basal pinnae fully adnate to the rachis although an auricle may be partly free f
 - f. Scales at the base of the petiole usually few, brown to blackish and usually nearly concolorous; the longest pinna ca. 0.5–4 cm long g
 - g. Lamina hardly reduced at the base, or more or less abruptly reduced to basal pinnae that are as long as broad or longer than broad 2. **B. confluens**
 - g. Lamina gradually reduced at the base to lobes that are broader than long 4. **B. asplenioides**
 - f. Scales at the base of the petiole numerous, wholly blackish or with a blackish center and brown margins; the longest pinna (7–)15–20(–25) cm long .. 7. **B. brasiliense**
 - a. Fertile segments contracted, with little or no green tissue extending beyond the attachment of the indusium; leaves dimorphic or if monomorphic then the sterile segments also contracted and with involute margins h
 - h. Scales at the base of the petiole absent, few, or numerous, lanceolate to usually lanceolate-ovate; stem decumbent, erect or climbing, rarely arborescent i
 - i. Leaves monomorphic; pinnae of the sterile lamina strongly involute, the margins usually reaching or nearly reaching the costa on the abaxial side 15. **B. loxense**
 - i. Leaves dimorphic; pinnae of the sterile lamina flat or somewhat involute and the margins distant from the costa on the abaxial side j
 - j. Pinnae of the sterile lamina narrowly or broadly adnate, or most of them so k
 - k. Adult plants with a scandent stem, hemiepiphytic or epiphytic, its scales, especially the older ones, mostly bicolorous with a blackish center and lighter margins 13. **B. binervatum**
 - k. Adult plants terrestrial, the stem scales concolorous l
 - l. Sterile lamina abruptly reduced at the base, sometimes to a wing or to lobes, 12–30 cm broad, the petiole with some very small, inconspicuous lobes 12. **B. divergens**
 - l. Sterile lamina gradually reduced at the base, ca. 1.5–10 cm broad m
 - m. Sterile lamina reduced at the base to small pinnae that are 2–4 mm long 9. **B. andinum**
 - m. Sterile lamina reduced at the base to definite lobes n
 - n. Pinnae of the sterile lamina mostly curved, ascending 8. **B. lehmannii**
 - n. Pinnae of the sterile lamina straight, strictly patent or nearly so 10. **B. penna-marina**
 - j. Pinnae of the sterile lamina sessile or short-stalked, or most of them so o
 - o. Sterile lamina with often biauriculate pinnae, with a much prolonged, viviparous apex of reduced pinnae 16. **B. sprucei**
 - o. Sterile lamina with cuneate, broadly rounded to cordate, not auriculate pinnae, the apex gradually to abruptly reduced, not viviparous p
 - p. Apex of the sterile lamina gradually reduced to an entire tip; many or most (rarely

only some) of the scales of the costa and rachis abaxially denticulate to ciliate, more or less spreading, light brown to dark brown and then sometimes bicolorous

- 14. **B. stipitellatum**
- p. Apex of the sterile lamina abruptly reduced to a large, entire, terminal segment; scales of the costae and rachis abaxially entire, rarely denticulate or ciliate, mostly appressed, whitish to light brown 11. **B. cordatum**
- h. Scales at the base of the petiole numerous, long, acicular beyond the usually broader base, curved; stem usually arborescent q
- q. Sterile lamina with few or no fully adnate pinnae distally, with the base of the lamina abruptly and usually hardly reduced r
- r. Sterile lamina with the pinnae mostly patent or slightly ascending; pinnae with the apex acute to long-acuminate, the margins flat, or at least the tip flat or nearly so; stem mostly bearing few leaves 17. **B. schomburgkii**
- r. Sterile lamina with the pinnae ascending to strongly ascending; pinnae with the apex obtuse, the margins involute to strongly involute, the tip involute; stem bearing a dense crown of numerous leaves 18. **B. auratum**
- q. Sterile lamina with many fully adnate pinnae distally, with the lamina base gradually reduced 19. **B. obtusifolium**

1. **Blechnum occidentale** L., Sp. pl. 1077, as "*orientale*." 1753. TYPE: LINN 1247.1, photo A is this species.

Blechnum caudatum Cav., Descr. pl. 262. 1802. TYPE (designated by C. Chr., Dansk Bot. Ark. 9(3): 20. 1937): Ecuador, San Antonio, *Née* (holotype, MA).

Blechnum glandulosum Link, Enum. hort. berol. alt. 2: 462. 1822. TYPE: Cultivated, "Hab in Brasilia" (holotype, *Herb. Link*, B; photo, GH).

Blechnum pectinatum Hooker, Hooker's Icon. Pl. 1: t. 95. 1837, not Presl, 1825. TYPE: Peru, Casapi, *Mathews* (holotype, K).

Blechnum × *caudatum* Cav. (*pro sp.*) (T. G. Walker, 1985).

Stem small, erect to usually decumbent and short-creeping. **Leaves** monomorphic. **Petiole** with basal scales rather few, short, mostly lanceolate to ovate-lanceolate, stem scales wholly light brown to dark brown or often with lighter margins. **Lamina** pinnatisect to 1-pinnate at the base, the apex gradually reduced, pinnatifid or with an entire tip shorter than the longest lateral pinna, not or slightly reduced at the base (rarely more), the pinnae essentially flat, the basal ones truncate, semicordate to cordate. **Fertile pinnae** with green tissues extending well beyond the attachment of the indusium.

Terrestrial and rupestral, lowland rain forests, montane forests, cloud forests, along streams, on banks, in thickets, among and on rocks, usually in moist and shaded sites, 400–3800 m, usually at 700–2400 m, Tumbes south to Arequipa and Puno.

Tropical America.

This is a common and variable species, part of

the variation undoubtedly due to hybridization. Walker (1985) noted the hybrid *B. fraxineum* × *occidentale*, which is called *Blechnum* × *caudatum* Cav. While the morphology of the hybrid may agree with the holotype, the latter cannot be cytologically known and may represent a homoploid variation of *B. occidentale*. Walker also repeated his report of *Blechnum asplenoides* (as *B. unilaterale*) × *occidentale*. *Mexia* 8216, Dept. Huanuco (MO), is clearly *B. fraxineum* × *occidentale*; another sheet of the same collection (GH) is *B. occidentale*.

Blechnum occidentale has a rachis that is glabrous or nearly so, and in Peru it grows from 400 to 3850 m. It is much more common than *Blechnum glandulosum* (*B. occidentale* var. *pubirhachis* Rosenst.), which has a definitely glandular-pubescent rachis. The two variations are altitudinally distinct in Central America (Stolze, Fieldiana, Bot., n.s., 6: 110–111. 1981) but not in Peru where there is considerable overlap in the altitude. The glandular-pubescent variation occurs from 650 to 2700 m. Accordingly, the two are treated as one taxon in Peru.

Tumbes: Between Caucho and Cotrina, *Coronado* 219 (GH). Prov. Zarumilla, near Campo Verde, *Simpson & Schunke* 457 (F, US, USM). **Piura:** Prov. Huancabamba, *Sagástegui & Cabanillas* 8543 (MO, US). **Lambayeque:** Prov. Lambayeque, km 45 from Olmos, *Plowman et al.* 14282 (F, GH). **Cajamarca:** Prov. Contumazá, El Molino, *Sagástegui et al.* 10895 (F). **Amazonas:** Prov. Bagua, entre Aramango y Montenegro, *López et al.* 4217 (GH, US). Just E of Chachapoyas, *Wurdack* 730 (F). **La Libertad:** Prov. Otuzco, Dist. Huaranchal, *Sagástegui* 95 (HUT). **San Martín:** Prope Tarapoto, *Spruce* 3950 (GH). **San Roque, Ll. Williams 7029, 7269, 7523 (F). **Huánuco:****

Prov. Huánuco, Dist. Churubamba, *Mexia* 8137 (F, GH, MO). Prov. Pachitea, Pano, *Ferreira* 1791 (GH, USM). Prov. Huánuco, Puente Durand, *Stork & Horton* 9425 (F, MO, US). **Lima:** Lomas de Atocongo, *Coronado* 291 (F, GH). Chosica, *Macbride & Featherstone* 489 (F, US). Prov. Huarochiri, *León* 177 (MO, USM). **Pasco:** 8 km N of Huancabamba, *Skog et al.* 5074 (US). **Junín:** Cerca a San Ramón, *Cerrate* 962 (GH). La Merced, *Killip & Smith* 23760 (F, US). **Huancavelica:** Prov. Tayacaja, SE of Tintay, *Tovar* 4704 (GH). **Ayacucho:** Estrella, between Huanta and Río Apurímac, *Killip & Smith* 22659 (F, GH, US). **Cuzco:** Prov. Urubamba, Machu Picchu, *Mexia* 8084 (F, GH, MO). Prov. La Convención, Potrero, *Tryon & Tryon* 5395 (F, GH, US). **Arequipa:** Lomas de Atiquipa, *Coronado* 30 (GH, US). **Puno:** Prov. Sandia, Sandia, *Vargas* 14813 (F).

2. *Blechnum confluens* Schlect. & Cham., *Linnaea* 5: 613. 1830. TYPE: Mexico, Hacienda de Laguna, *Schiede* 779 (holotype, B, photo, GH; isotype, *Schiede & Deppe* 779, B, photo, GH).

Blechnum triangulare Link, *Hort. berol.* 2: 76. 1833. TYPE: Cultivated (holotype, B, *Herb. Link*, photo GH; isotype?, "e Mexico, *Blechnum triangulare* Spr." *Sprengel script.*, B, photo, GH). Although Link published the name first, he says he received it from Sprengel.

Stem small, erect to decumbent and short-creeping. **Leaves** monomorphic. **Petiole** with basal scales rather few, short, mostly lanceolate to ovate-lanceolate, stem scales wholly light brown to dark brown or often with lighter margins. **Lamina** pinnatisect, the apex gradually reduced, pinnatifid, reduced at the base to pinnae that are longer than broad or as long as broad, the pinnae essentially flat, the longest ca. 1–4 cm long. **Fertile pinnae** with green tissue extending well beyond the attachment of the indusium.

Terrestrial or rupestral, in forests, on wet banks, among rocks, or in rock crevices, 670–2300 m, Amazonas south to Junín.

Tropical America.

This species is more or less intermediate between *B. occidentale* and *B. asplenioides*; some (all?) specimens might represent hybrids between those species. The basal lobes in *B. asplenioides* are fully adnate and broader than long, while in *B. confluens* they are longer than broad or about as long as broad and only partly adnate to the rachis.

Amazonas: E of Chachapoyas, *Wurdack* 730 (GH). **San Martín:** Monte Guayrapurima, prope Tarapoto, *Spruce* 4022 (GH, US). Prov. Lamas, Dist. Lamas, *Belshaw* 3424 (F, GH, US). Lamas, *Ll. Williams* 6341 (F). **Huánuco:**

Prov. Leoncio Prado, Dist. Rupa Rupa, *J. Schunke* V. 5081 (GH). Between Tingo María and Monzón, *Croat* 57909 (F). La Divisoria, *Gentry et al.* 18864 (F). **Pasco:** Prov. Oxapampa, *Soukup* 6810 (GH). **Junín:** Prov. Tarma, Utcuyacu, *Woytkowski* 35371 (GH). Near La Merced, *Killip & Smith* 23994 (F).

3. *Blechnum fraxineum* Willd., *Sp. pl. ed.* 4, 5: 413. 1810. TYPE: Venezuela, Caracas, *Bredemeyer* (holotype, B, *Herb. Willd.* 20044, photo, GH). Not *Lomaria fraxinea* Willd., *op. cit.* 1810. **Figure 3c.**

Blechnum longifolium Willd., *Sp. pl. ed.* 4, 5: 413. 1810, not Cav. 1802. TYPE: Venezuela, Caripe, *Humboldt* 464 (holotype, B, *Herb. Willd.* 20045, photo, GH).

Blechnum gracile Kaulf., *Enum. fil.* 158. 1824. TYPE: "Brasil, *Otto* comm." (not seen), *ex char.*

Stem small, erect to decumbent and short-creeping. **Leaves** monomorphic. **Petiole** with basal scales usually rather few, rather short, mostly lanceolate to ovate-lanceolate, stem scales brown to dark brown, sometimes with narrow lighter margins. **Lamina** pinnatisect to 1-pinnate, the apex abruptly reduced to an apical pinna that is longer than the longest lateral pinna, not or slightly reduced at the base, the pinnae essentially flat. **Fertile pinnae** with green tissue extending well beyond the attachment of the indusium.

Terrestrial or rupestral, on clay banks, along streams, and among rocks, 450–2000 m, Amazonas, south to Cuzco.

Tropical America.

Walker (1985) reported a diploid and a tetraploid from Trinidad. The tetraploid, which is more dimorphic than the diploid and with additional (6–14) pinnae, is evidently more common in Peru than the diploid, with 2–4 pinnae. The identification of Peru material is uncertain pending cytological studies that have not been made. *Blechnum gracile* is a name for the tetraploid and *B. meridense* Kl. for the diploid. The type of *B. fraxineum* is considered to be a triploid hybrid of *B. meridense* and *B. occidentale*. The essential character of the species and its hybrids is the long terminal segment.

Amazonas: Prov. Bagua, valley of Río Marañón, above Cascadas de Mayasi, *Wurdack* 1822 (GH, US, USM). **San Martín:** San Roque, *Ll. Williams* 7519 (F). Tarapoto, *Spruce* 4026 (US). **Junín:** La Merced, *Macbride* 5500 (F, US). Chanchamayo valley, *C. Schunke* 31 (F), 132 (F, US), 1352 (F). Above San Ramón, *Killip & Smith* 24731 (US). **Ucayali:** La Divisoria, *Tryon & Tryon* 5271 (GH, US).

Cuzco: Prov. Paucartambo, Pillawata, *Vargas 16729* (GH). QUILLABAMBA, *CORONADO 127* (US).

4. *Blechnum asplenioides* Sw., Kongl. Vetensk. Acad. Handl. 1817: 72, t. 3, f. 3. TYPE: Brazil, Villa Rica, *Freyreis* (holotype, s, *Herb. Swartz*, photo, GH, US). **Figures 3a-b.**

Asplenium blechnoides Sw., Syn. fil. 76. 1806. TYPE: Peru, evidently *Née* ex Lagasca (holotype, s; photo, GH, US).

Blechnum unilaterale Sw., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 4: 79. 1810, also Willd., Sp. pl. ed. 4, 5: 407. 1810. Both authors cite *Asplenium blechnoides* Sw. in synonymy; hence the name is superfluous and has the same type as *Asplenium blechnoides*.

Blechnum polypodioides Raddi, Opusc. Sci. 3: 294. 1819, not (Sw.) Kuhn, 1868. TYPE (from Raddi, Pl. bras. nov. gen. 53, t. 60, f. 2. 1825): Brazil, Corcovado, *Raddi* (holotype, ?).

Blechnum blechnoides (Sw.) C. Chr., Index fil. 151. 1906, not Keyserl., 1873.

Stem small, erect to decumbent and short-creeping. **Leaves** monomorphic. **Petiole** with basal scales rather few, mostly short, lanceolate to narrowly lanceolate, stem scales light brown to dark brown or with a dark brown center. **Lamina** pinnatifid to pinnatisect, the apex gradually reduced, pinnatifid, the base gradually reduced to lobes that are broader than long, pinnae essentially flat, the longest ca. 0.5–2.5 cm long. **Fertile segments** with green tissue extending well beyond the attachment of the indusium.

Terrestrial or rupestral, wet forests, secondary forests, shaded stream banks, clay soil of road banks, or on rocks, 300–1800 m, Amazonas south to Cuzco.

Tropical America.

This species is distinguished by the small basal lobes of the lamina. It is usually a small plant, although sometimes the leaf reaches a length of ca. 50 cm.

Amazonas: Prov. Bagua, Río Marañón, above Cascadas de Mayasi, *Wurdack 2056* (F, GH, US). Prov. Bagua, NE of Chiriaco, *Barbour 4509* (USM). **San Martín:** Zepelacio, near Moyobamba, *Klug 3358* (F, GH, US). Prov. Lamas, Lamas, *Ferreyra 4691* (GH, USM). San Roque, *Ll. Williams 7144* (F). **Loreto:** Pampayacu, *Klug 3237* (F, GH, US). **Huánuco:** Villcabamba, *Macbride 4991* (F, GH, US). Tingo María, *Tryon & Tryon 5259* (F, GH, US). **Pasco:** Dos de Mayo, Pichis Trail, *Killip & Smith 25861* (F, GH). **Junín:** La Merced, *Soukup 2374* (GH). Near La Merced, *Killip & Smith 23959* (F, US). Chanchamayo valley, *C. Schunke 2, 26, 182, 777, 1374* (F). **Ucayali:** La Divisoria, *Allard 22174* (GH). La Divisoria, *Gentry et al. 18832* (F,

USM). **Cuzco:** Prov. Quispicanchis, entre Quince Mil y San Lorenzo, *Vargas 11761* (GH). Prov. La Convención, valley of Río Vilcanota, *Mexia 8052* (F, GH, US). Prov. Paucartambo, Kosñipata valley, *Plowman & Davis 5114* (GH). **Madre de Dios:** 39 km SW of Puerto Maldado, *Smith et al. 1128* (US).

5. *Blechnum lanceola* Sw., Kongl. Vetensk. Acad. Handl. 1817: 71, t. 3, f. 2. TYPE: Brazil, Villa Rica, *Freyreis* (holotype, s, *Herb. Swartz*, photo, GH, US).

Stem small, erect to decumbent and very short-creeping. **Leaves** monomorphic. **Petiole** with basal scales few to nearly lacking, short, mostly lanceolate to ovate-lanceolate, stem scales light to dark brown, or with lighter narrow margins. **Lamina** entire or rarely with 1 or 2 small lobes at the base, mostly very narrowly elliptical, essentially flat. **Fertile lamina** with green tissue extending well beyond the attachment of the indusium.

A single collection from San Martín, Peru.

Peru south to Argentina and east to Brazil.

This species is represented by small plants 4–15 cm, or occasionally to 30 cm, tall. The entire lamina is distinctive, although rarely there may be one or two lobes at the base. It is evidently rare in the Andes and more common in southeastern Brazil.

San Martín: Monte Campana, prope Tarapoto, *Spruce 4672* (GH, US).

6. *Blechnum serrulatum* Rich., Actes. Soc. Hist. Nat. Paris 1: 114. 1792. TYPE: "Cayenne" (French Guiana), *Le Blond* (holotype, p, *Herb. Richard*, photo, GH, US).

Stem widely creeping (in deep sandy soil), its ascending branches bearing the leaves. **Leaves** monomorphic. **Petiole** with few or no scales at the base, stem scales wholly dark brown or with lighter margins or small and light brown only. **Lamina** 1-pinnate, with an entire apical segment, not or hardly reduced at the base, pinnae essentially flat, articulate to the rachis, more or less serrulate, the largest ca. 5–15 cm long. **Fertile pinnae** with green tissue extending well beyond the attachment of the indusium.

Sandy soil in secondary vegetation, 180 m, Loreto.

Tropical America, south to Peru and northeastern Argentina.

The species has monomorphic leaves and differs from all species in South America in having articulate pinnae. In sandy deep soil, the main stem is deeply subterranean and has ascending branches that bear the leaves.

Loreto: Jenaro Herrera, *Mejia & Van der Well* 221 (USM).

7. ***Blechnum brasiliense*** Desv., *Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk.* 5: 330. 1811. TYPE: Brazil, *Dombey* (holotype, P, *Herb. Jussieu* 1390, photo, GH, US).

Blechnum nigrosquamatum Gilbert, *Bull. Torrey Bot. Club* 24: 258. 1897. TYPE: Bolivia, Colapampa, *Bang* 2314 (holotype, not located; isotype, GH!).

Stem subarborescent to arborescent, stout, to 2 m tall. **Leaves** monomorphic. **Petiole** with scales at the base many, mostly 10–15 mm long, acicular, blackish or with a blackish center, stem scales dark brown to blackish or with a dark center and lighter (to brown) margins. **Lamina** pinnatifid to pinnatisect, the apex gradually reduced, pinnatifid, or with a short entire tip, gradually reduced, pinnatifid, or with a short entire tip, gradually reduced at the base to small pinnae or lobes, pinnae essentially flat, the largest ca. (7–)15–20(–25) cm long. **Fertile pinnae** with green tissue extending well beyond the attachment of the indusium.

Terrestrial, mountain forests, 1200–1600 m, San Martín.

Guatemala; tropical South America.

The petiole is usually short to nearly absent. The long, narrow scales at the base of the petiole combined with the monomorphic leaves are distinctive features of this species.

San Martín: Zepelacio, near Moyobamba, *Klug* 3433 (F, GH, US). Murillo (1968) also cites: Monte Campana, Tarapoto, *Spruce* 4673 (BR).

8. ***Blechnum lehmannii*** Hieron., *Bot. Jahrb. Syst.* 34: 473. 1904. TYPE: Colombia, Río Timbiquí, *Lehmann* 8928 (holotype, B; isotype, US!).

Struthiopteris maxonii Broadh., *Bull. Torrey Bot. Club* 39: 268. 1912. TYPE: Panama, Chiriquí, Cerro de la Horqueta, *Maxon* 5415 (holotype, US; isotype, GH!, US!).

Blechnum maxonii (Broadh.) C. Chr., *Index fil. suppl.* 16. 1913.

Stem more or less erect, rather slender. **Leaves** dimorphic. **Petiole** with basal scales few to rather numerous, brownish, mostly large, concolorous, lanceolate-ovate or broader, stem scales acuminate, brown to dark brown, to blackish (some), concolorous. **Sterile lamina** pinnatisect, the apex gradually reduced or with a short to long entire tip, the base gradually reduced to lobes, pinnae curved-ascending, fully adnate to the rachis, the margins flat to somewhat involute, distant from the costa. **Fertile pinnae** with green tissue hardly extending beyond the attachment of the indusium.

Terrestrial, cloud forests, 1750 m, Cuzco.

Southern Mexico; Central America; Venezuela and Colombia, south to Peru.

The stem may be erect and to 40 cm tall; the sterile lamina is 3–10 cm, usually 4–6 cm broad.

This is closely related to, perhaps conspecific with, *B. l'herminieri* (Kunze) Mett. of the West Indies. That species has the petiole dark, and the lamina is abruptly reduced basally in contrast to *B. lehmannii*, which has a light-colored petiole and a lamina that is gradually reduced at the base. *López & Sagástegui* 5297 (GH, HUT), from Prov. Chota, Cajamarca, seems to be this species, but the petioles are mostly dark, rather than straw-colored as in typical *B. lehmannii*. The collection may represent an intermediate between the two taxa.

Cuzco: Prov. La Convención, Cordillera Vilcabamba, Knox's Cascade, *Dudley* 10463 (GH). *Dudley* 10489 from the same place (GH) is a sheet of juvenile plants, most probably of this species.

9. ***Blechnum andinum*** (Baker) C. Chr. *Ind. fil.* 150. 1905.

Lomaria andina Baker, *Syn. fil. ed.* 2: 482. 1883.

TYPE: Andes, "Unduari" (Unduavi), Bolivia, 10,000 ft, *Pearce* (holotype, K; photo, GH, US).

Blechnum subtile Rosenst., *Repert. Spec. Nov. Regni Veg.* 11: 54. 1912. TYPE: Unduavi, Bolivia. *Buchtien* 2779 (holotype, not located; isotype, US!).

Stem small, erect, stoloniferous, the stolons very slender and threadlike. **Leaves** small, dimorphic. The fertile and sterile about the same length. **Petiole** lacking scales or with a few, brownish, concolorous ones, stem scales more or less small, brownish, sometimes with lighter margins. **Sterile lamina** 1-pinnate, the apex and base gradually reduced, the base reduced to small pinnae, the pinnae obtuse, narrowly to broadly adnate. **Fertile**

pinnae with green tissue hardly extending beyond the attachment of the indusium.

Wet forests, on trees and in a cave, 3050 m, Cuzco.

Peru; Bolivia; and southern Brazil.

This is a very small species, the leaves usually 6–12 cm long.

Cuzco: Michihianuca, Bues 973 (us). Huadquina, Bues 980 (us).

10. *Blechnum penna-marina* (Poiret) Kuhn, Fil. Afr. 92. 1868.

Polypodium penna-marina Poiret in Lam., Encycl. 5: 520. 1804. TYPE: Straits of Magellan, *Commer-son* (holotype, *Herb. Desfontaine*, p; photo, GH).

Stem small, more or less erect, freely stoloniferous and sometimes forming large clumps of plants. **Leaves** small, dimorphic, the sterile shorter and spreading, the fertile longer and erect. **Petiole** with a few brownish, concolorous scales, stem scales brown, more or less reddish brown, to light brown or dark brown, concolorous, more or less acute to acuminate. **Sterile lamina** mostly 5–10 (–15) cm long, narrow, pinnatisect, gradually reduced to the apex, at the base reduced to small lobes. **Fertile pinnae** with green tissue hardly extending beyond the attachment of the indusium.

Terrestrial, 3390 m, Cuzco.

Peru and southeastern Brazil; to southernmost Chile and Argentina; circumantarctic islands; southeastern Australia; New Zealand. Mettenius (Fil. Lech. 2: 15. 1859.) reported this species for Peru as *Blechnum alpinum* var. *elongatum* (Puno, Agapata, *Lechler*). I have not seen this specimen, and it is possible that it is some other species. In any event, the following is a recent collection.

Cuzco: Prov. Paucartambo, Cerro Macho Cruz, Manú National Park, *B. León et al.* 2757 (Cuz, USM).

11. *Blechnum cordatum* (Desv.) Hieron., Hedwigia 47: 239. 1908.

Lomaria cordata Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 5: 330. 1811. TYPE: omitted in the publication. Holotype evidently "Perou-Concepcion," *Dombey*, p, *Herb. Jussieu* 1368; photo, GH, US.

Lomaria chilensis Kaulf., Enum. fil. 154. 1824. TYPE: Chile, *Chamisso* (holotype, LE?)

Lomaria ornifolia Presl, Reliq. haenk. 51. 1825. TYPE:

"Hab. in Peruviae?" Placed as a synonym of *Blechnum cordatum* by Hieron., Hedwigia 47: 239. 1908.

Lomaria serrulosa Desv., Mém. Soc. Linn. Paris 6: 290. 1827. TYPE: "Peruvia" (holotype, p; photo, GH, US).

Lomaria arborescens Klotzsch, Linnaea 20: 347. 1844. SYNTYPES (designated by Hieron., Hedwigia 47: 240. 1908): Venezuela, Merida, *Moritz* 299 (b) and Venezuela, *Karsten Coll. II*, 25 (b). Isosyn-type, *Moritz* 299, BM; photo, GH; frag., US!

Blechnum chilense (Kaulf.) Mett., Fil. lechl. 1: 14. 1856.

Blechnum ornifolium (Presl) Ettingsh., Denkschr. Kaiserl. Akad. Wiss. Wien. 23: 61. 1864.

Blechnum arborescens (Klotzsch) Hieron., Hedwigia 47: 239. 1908.

Blechnum peruvianum Hieron., Hedwigia 47: 245, t. 10. f. 19. 1908. TYPE: Peru, Río Huallaga, Moyobamba, *Stübel* 1105 (holotype, b; photo, us).

Stem erect and subarborescent to decumbent and short-creeping, moderately to very stout. **Leaves** dimorphic. **Petiole** with basal scales small to rather large, few to many, concolorous and mostly brown, linear to lanceolate to lanceolate-ovate or broader, stem scales broad, thin, concolorous, light brown or reddish brown. **Sterile lamina** 1-pinnate, the apex abruptly reduced to a terminal segment, the base not or only slightly reduced, pinnae sessile to definitely stalked, strictly patent to somewhat ascending, cuneate to broadly rounded to cordate, the margins flat or slightly involute, distant from the costa. **Fertile pinnae** with green tissue extending hardly beyond the attachment of the indusium.

Terrestrial, wet montane forests, cloud forests, thickets, along streams, on clay road banks, and on old landslides, 700–3300 m, Piura south to Cuzco.

Venezuela and Colombia, south to Peru; eastward to southeastern Brazil; Chile; Juan Fernandez Islands, West Falkland Islands; entire range not certain.

This is a variable species, primarily of the Andes from Venezuela and Colombia, south to Chile. The leaves are often large, to 1 m or more long, the apex is abruptly reduced to a large terminal segment, and the scales of the costae and rachis are mostly rather appressed and concolorous, whitish to light brown.

The species is variable in many characters—for example, acrophores are absent, or present on some pinnae and then low to conical, the rachis may be smooth or strongly roughened and it varies from straw-colored to dark reddish. There seems to be

no basis, at least in Peru, for the recognition of more than one taxon. A. R. Smith (1985) also treated *Blechnum cordatum* as a wide-ranging species with many synonyms. As in the case of other variable species, related ones recognized to the north of South America may be distinctive. A careful revision of this complex is much needed.

The photograph of the type of *Lomaria cordata* clearly shows that the label reads "Perou-Concepción," rather than "Peru, Concepción," as indicated by Morton on the covering label. Dombey never collected at or near a Concepción in Peru, but he did travel from Lima to Concepción, Chile, where he evidently collected the type specimen.

Piura: Prov. Ayabaca, *Sagástegui & Cabanillas 8702* (F, HUT). **Lambayeque:** 4 km NW of Incahuasi, *Dillon & Skillman 4155* (F, GH, USM). Arriba de Incahuasi, *Sagástegui et al. 12893* (F, GH). **Amazonas:** Mountain E of Balsas, *Osgood & Anderson 72* (F). **San Martín:** Prov. San Martín, Dist. Tarapoto, *Hickok 636* (GH). Prov. Lamas, Cerro Blanco, *J. Schunke V. 6259* (F). Prov. Mariscal Cáceres, Río Abiseo National Park, *Young 1768* (USM). **Loreto:** Pumayacu, *Klug 3243* (GH, US). **Anacash:** Above Yungay, *Correll & Smith P964* (GH). Prov. Huaylas, *López et al. 8378* (F, HUT). Prov. Yungay, *Laguna Llanganuco, Mostacero et al. 1402* (F, GH). **Huánuco:** Carpish, *Tryon & Tryon 5317* (GH). Prov. Huánuco, Dist. Churubamba, *Mexia 8174* (F, GH, US). Mito, *Macbride & Featherstone 1522* (F, US). **Lima:** Prov. Canta, 4 km from Huaman-tanga, *Saunders 1254* (GH). **Pasco:** Quillasú, *Soukup 3289* (or 3284) (F, GH). Prov. Oxapampa, road Oxapampa-Paucartambo, *Smith & Pretel 1631* (F). Prov. Oxapampa, "La Esperanza," *León 613* (USM). **Junín:** Villa Amoretti, *Kunkel 655* (GH). Chanchamayo valley, *C. Schunke 162* (F). La Merced, *Soukup 1087* (F). **Huancavelica:** Prov. Tayacaja, cerca a Tocas, *Tovar 2044* (GH, USM). **Ayacucho:** Prov. La Mar, 20–25 km from Tambo, *Dudley 11942* (GH). **Cuzco:** Prov. La Convención, San Luis, *Vargas 19858* (GH). Prov. La Convención, Cordillera Vilcabamba, *Dudley 10329* (GH), *10584* (GH), *10609* (GH). 5 km N of Aguas Calientes, *Solomon 3169* (F, USM).

12. *Blechnum divergens* (Kunze) Mett., Ann. Sci. Nat. Bot. 5, 2: 225. 1864.

Lomaria divergens Kunze, Linnaea 9: 57. 1834. TYPE: Peru, Dept. Huánuco, Pampayaco, *Poeppig Diar. 1141* (not located).

Lomaria pteropus Kunze, Farnkr. 1: 97. 1842, nom. nov. for *Acrostichum heterophyllum* Raddi, Pl. bras. nov. gen. 5, t. 17. 1825. TYPE: Brazil, Mandioca, *Raddi* (holotype, F?), not *Lomaria heterophylla* Desv., 1811, nor *Blechnum heterophyllum* (Desv.) Schlect., Adumbr. pl. 37. 1827. *Blechnum pteropus* (Kunze) Mett., Fil. hort. bot. Lips. 61. 1856.

Stem erect to rather long-creeping, moderately stout. **Leaves** dimorphic. **Petiole** with basal scales few, rather large, concolorous, lanceolate to lan-

ceolate-ovate, stem scales broad, dark brown to blackish, concolorous. **Sterile lamina** pinnatisect, the apex rather abruptly reduced to a short or long, entire tip, the base abruptly reduced, sometimes to a wing or to lobes that may be distant and inconspicuous, pinnae patent to somewhat ascending, fully adnate or rarely partly adnate, the margins flat, distant from the costa. **Fertile pinnae** with green tissue extending hardly beyond the attachment of the indusium.

Terrestrial or rarely epiphytic, cloud forests, dense, wet forests, 1500–2400 m, Cajamarca, Huánuco, Junín, and Cuzco.

Tropical America.

In South America, specimens of *Blechnum divergens* and *B. binervatum* ssp. *acutum* are not always readily distinguished, due to variation in both taxa. *Blechnum divergens* is a terrestrial species, rarely epiphytic in very wet cloud forest, and the stem has broad, concolorous scales. The sterile lamina is broad, 12–30 cm, and is abruptly reduced at the base to a petiole that is either alate or has lobes, often small and inconspicuous, that are much broader than long. The basal or proximal pinnae are usually not or not much decurrent and hardly if at all narrowed toward the adnate base.

Blechnum binervatum ssp. *acutum* often has a broad sterile lamina that is abruptly reduced at the base, and the basal or proximal pinnae are usually strongly decurrent or narrowed to the expanded and adnate base.

Cajamarca: Prov. Cutervo, Parque Nacional de Cutervo, *Diaz & Osore 259911* (MO). **Huánuco:** SW slope of Río Lullapichis watershed, ascent of Cerros del Sira, *Dudley 13407B* (GH). **Junín:** Chanchamayo valley, *C. Schunke 11*, 159, 160, 1382 (F). Prov. Chanchamayo, Río Rundayacu, *Smith & Bokor 2104* (F). **Cuzco:** Prov. La Convención, Quellouno to Chirumbia, *Vargas 11396* (GH). Prov. Paucartambo, between Pillawata and Patria, *Plowman & Davis 4935* (GH, US).

13. *Blechnum binervatum* (Poiret) Morton & Lell., Amer. Fern J. 57: 67. 1967.

Polypodium binervatum Poiret in Lam., Encycl. 5: 521. 1804. TYPE: collector and locality not known but probably in the Lesser Antilles (holotype, P, Herb. Jussieu 1365; photo, GH).

Stem scandent, somewhat slender to rather stout. **Leaves** dimorphic. **Petiole** with basal scales few or numerous, short to moderately long, rather lanceolate, mostly bicolorous (in Peru) with a blackish center and lighter margins, or concolorous (ssp.

binervatum). **Sterile lamina** pinnatisect or 1-pinnate proximally, the apex gradually or abruptly reduced to an entire tip, the base somewhat to strongly reduced to lobes, pinnae patent to ascending, mostly fully adnate, the margins flat or nearly so, distant from the costa. **Fertile pinnae** with green tissue extending hardly or only slightly beyond the attachment of the indusium.

This is a variable species, with three subspecies that formerly were usually recognized as species. The ssp. *binervatum*, with concolorous stem scales, is confined to the Lesser Antilles and Puerto Rico.

This is the only scandent-epiphytic species in Peru. The stem may be rooted in the ground and climbing on tree trunks, especially on Cyathea-

ceae, or it may (probably) be wholly epiphytic; very rarely the plant is rupestral, or juvenile plants may be terrestrial.

Southern Mexico and Central America; Antilles; Venezuela to Colombia; south to Bolivia; south-eastern Brazil.

Key to Subspecies of *Blechnum binervatum*

The following key provides the typical characters of the subspecies; these intergrade, and not all specimens have the characteristic complement of characters. For example, *Peyton & King 1420*, Dept. Cuzco, at MO is nearly ssp. *fragile*, while at GH it is more like ssp. *acutum*.

- a. Sterile lamina 3–10 cm broad, gradually reduced at the base; pinnae usually close and the sinus narrow; stem scales toothed, often freely so, especially near the apex of the stem 13a. ssp. *fragile*
- a. Sterile lamina 10–25 cm broad, more or less abruptly reduced at the base; pinnae often spaced and the sinus broad; stem scales with few and small teeth or none 13b. ssp. *acutum*

13a. *Blechnum binervatum* ssp. *fragile* (Liebm.) Tryon & Stolze, *comb. nov.* Figures 3d–f.

Lomaria fragile Liebm., Kongel. Dankse Vid. Selsk. Skr. Naturvidensk. Afd. 5, 1: 232. 1849. TYPE: Mexico, Barranca de Huitamalco, *Liebm* (Fl. Mex. 773) (lectotype, selected by A. R. Smith, 1981); C folio, frag., us!; isolectotype, Barranca de Huitamalco, L, photo, GH).

Blechnum fragile (Liebm.) Morton & Lell., Amer. Fern J. 57: 68. 1967.

Osmunda polypodioides Sw., Prod. 127. 1788. TYPE: Jamaica, *Swartz* (holotype, s, photo, US; isotype, BM, photo, GH).

Blechnum polypodioides (Sw.) Kuhn, Fil. afr. 92. 1868, not Raddi, 1819.

Other synonyms, mostly not currently used, are in the reference for *Blechnum fragile*.

In dense rain forests and cloud forests, 1550–3300 m, Cajamarca south to Cuzco.

Southern Mexico and Central America; Greater Antilles; Venezuela and Colombia, south to Bolivia; southeastern Brazil.

Cajamarca: Prov. Cutervo, Parque Nacional de Cutervo, *Diaz & Osore* 2596 (MO). **Amazonas:** Upper slopes of Puma-urca, ESE of Chachapoyas, *Wurdack* 695 (GH). Prov. Bongará, *Shillac, Smith & Vasquez* 4898 (MO, USM). **San Martín:** Río Abiseo National Park, *Young & Watson* 3350 (USM). **Huánuco:** SW slope of Río Lullapichis watershed, ascent of Cerros del Sira, *Dudley* 13284 (GH). **Müna,** *Macbride* 4292 (F, GH). **Paíco:** Oxapampa, *Soukup* 2337 (F, GH). **Río San Alberto,** *Foster et al.* 10316 (USM). **Junín:** Pichita Caluga, *Walden* 37, 74 (GH). **Cuzco:**

Prov. La Convención, Huayopata, *Peyton & King 1420* (MO).

13b. *Blechnum binervatum* ssp. *acutum* (Desv.) Tryon & Stolze, *comb. nov.*

Lomaria angustifolia HBK., Nov. gen. sp. 1: 18. 1816.

TYPE: Ecuador, Villa de Ibarra, *Humboldt & Bonpland* (B or P?, not seen).

Lomaria acuta Desv., Mém. Soc. Linn. Paris 6: 290. 1827. LECTOTYPE: *Dombey* (designated by Weatherby, Contr. Gray Herb. 114: 26. 1936): “Habitat in Peruvia” (holotype, P; photo, GH).

Lomaria cuspidata Kunze, Linnaea 9: 59. 1834. TYPE: Peru, Pampayaco, *Poeppig, Diar.* 1120 (isotype, B?, not seen).

Lomaria meridensis Klotzsch, Linnaea 20: 345. 1847. TYPE: Venezuela, Merida, *Moritz* 297 (holotype, B, not seen).

Lomaria ensiformis Liebm., Kongel. Danske Vidensk. Selsk. Skr. Naturvidensk. Afd. 5, 1: 234. 1849. TYPE (selected by A. R. Smith, 1981): Mexico, Oaxaca, Distr. Chinantla, Teotalcingo, *Liebm* (Pl. Mex. 2342) (lectotype, c, folio, sheet with both fertile and sterile leaves, frag., us!).

Blechnum meridense (Klotzsch) Mett., Fil. hort. lips. 61. 1856, based on *Lomaria meridensis*, not *Blechnum meridense* Klotzsch, 1847.

Blechnum acutum (Desv.) Mett., Ann. Sci. Nat. Bot. Ser. 5, 2: 225. 1864.

Blechnum angustifolium (HBK.) Hieron., Bot. Jahrb. Syst. 34: 472. 1904, not Willd., 1810.

Blechnum ensiforme (Liebm.) C. Chr., Index fil. 153. 1905.

Blechnum kunthianum C. Chr., Index fil. suppl. 16: 1913, *nom. nov.* for *Lomaria angustifolia* HBK., not *Blechnum angustifolium* Willd., 1810.

Southern Mexico and Central America; Venezuela and Colombia, south to Bolivia; southeastern Brazil.

In humid forests, in rain forests, and in wet cloud forests, 1000–2700 m, Amazonas south to Cuzco.

In South America this subspecies is especially variable in the characters of the sterile lamina. Usually the distal pinnae are fully adnate and broadest at the base, but neither excurrent nor decurrent, and the pinnae are close with a narrow sinus between them. Proximal pinnae may be similar or they may be somewhat spaced and excurrently and decurrently broadened at the base. These characters, however, vary to the extreme (*Lomaria acuta* Desv.), with few and widely spaced pinnae that are narrowed toward the base where they are fully adnate.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2507 (F, MO). **San Martín:** Prov. Rioja, Pedro Ruiz-Moyobamba, *D. Smith* 4451 (F). Prov. Rioja, Pedro Ruiz-Moyobamba, *Smith & Vasquez* 4709 (MO, USM). **Huánuco:** SW slope of Río Lluallapichis watershed, ascent of Cerros del Sira, *Dudley* 13253 (GH). **Pasco:** Prov. Oxapampa, Oxapampa, *Soukup* 2339 (GH). Prov. Oxapampa, Río El Tunqui, *Smith & Alban* 5524 (F). Prov. Oxapampa, SW of Oxapampa, *Foster* 7624 (USM). **Junín:** Prov. Chanchamayo, Río Rundayacu, *Smith et al.* 2616 (F, USM). **Ucayali:** Prov. Leóncio Prado, La Divisoria, *Plowman & Schunke* 7418 (F). **Cuzco:** Prov. La Convención, 3 km from Incatambo, *Peyton & Peyton* 851 (GH, MO). Quillabamba, Santa Teresa, *Peyton & Peyton* 1273 (GH, MO); Prov. Paucartambo, Parque Nacional Manú, *León* 2194 (F).

14. *Blechnum stipitellatum* (Sodirol) C. Chr., Index fil. 160. 1905.

Lomaria stipitellata Sodirol, Recens. crypt. vasc. Quit. 29. 1883. SYNTYPES: Ecuador, Corazón y Atacazo, 2500–3400 m. *Sodirol* (syntype or isosyntype, Corazón, *Sodirol*, p, photo, GH).

Blechnum rubicundum Hieron., Hedwigia 47. 242, t. 4, f. 16. 1908. TYPE: Colombia, Cumbal to La Ceja de Mayasquer, *Stübel* 347 (holotype, B; photo, US).

Stem moderately to rather stout, erect to decumbent and very short-creeping. **Leaves** dimorphic. **Petiole** with basal scales mostly large, mostly concolorous, sometimes bicolorous, brown, few to many, linear to lanceolate to lanceolate-ovate, stem scales large, brown to dark brown or reddish brown often with lighter (broad) margins, acute more or less thin, sometimes concolorous. **Sterile lamina** 1-pinnate, the apex gradually reduced to an entire tip, the base slightly or not reduced, pinnae usually

patent to slightly ascending, sessile to short-stalked, more or less truncate, the margins flat to somewhat involute, distant from the costa. **Fertile pinnae** with green tissue extending only slightly beyond the attachment of the indusium.

Terrestrial, in wet forests and among rocks, 2400–3700 m, Amazonas, south to Puno.

Colombia, south to Bolivia.

This seems to be a distinctive species, but it is little known and its variation is uncertain.

Many or most of the scales on the costa and rachis abaxially are more or less spreading, light brown to dark brown and then sometimes bicolorous. The scales, or at least some of them, are denticulate to ciliate on the margins. The lamina has many, usually 20–40 pairs of close, patent pinnae. At least when dried, the pinnae are often prominently striate adaxially—the tissue between the veins being depressed.

This species seems close to some variations of *Blechnum cordatum*, but the expanded sterile pinnae suggest it may be a shade form of *Blechnum loxense*.

Amazonas: Prov. Bagua, Cordillera Colán, *Barbour* 3467 (MO). **Huánuco:** Between Huánuco and Pampayacu, *Kanehira* 144 (GH, USM). Huánuco-Tingo María road, *Gentry et al.* 33851 (F). **Pasco:** Prov. Oxapampa, Cordillera San Gutardo, *León et al.* 517 (USM). **Junín:** Prov. Satipo, Dist. Pampa Hermosa, *Saunders* 1069 (GH). **Cuzco:** Prov. Urubamba, above Palca, *Peyton & Peyton* 767 (GH, MO). **Puno:** Agapata, *Lechler* 2025, in part (GH).

15. *Blechnum loxense* (HBK.) Salomon, Nomencl. Gefäskrypt. 117. 1883.

Lomaria loxensis HBK., Nov. gen. sp. 1: 18. 1816.

TYPE: Ecuador, “Andibus Peruviae inter Gonzanama et Loxa,” *Humboldt & Bonpland* (holotype, p, photo, GH).

Lomaria squamulosa Desv., Mém. Soc. Linn. Paris 6: 290. 1827. “Habitat in Peruvia,” *Dombey* (p, photo, US).

Lomaria stenophylla Klotzsch, Linnaea 20: 346. 1847. TYPE: of *alpha*, Peru, *Dombey* (B; photo, US). This and also *beta* are both *B. loxense* according to Hieronymus, Hedwigia 47: 241. 1908. Not *Blechnum stenophyllum* Presl, 1851.

Blechnum stenophyllum (Klotzsch) Mett., Fil. hort. bot. lips. 64. 1856. Not *Blechnum stenophyllum* Presl.

Blechnum squamulosum (Desv.) Mett., Ann. Sci. Nat. Bot. Ser. 5, 2: 225. 1864.

Stem stout to massive, erect to somewhat decumbent and very short-creeping. **Leaves** monomorphic. **Petiole** with basal scales usually numer-

ous, large, brown and concolorous, stem scales mostly broad, light brown to brown to more or less reddish brown with or without a darker center. **Sterile lamina** 1-pinnate, the apex abruptly reduced to a terminal segment, the base hardly or not reduced, the pinnae ascending, usually cordate, the margins strongly involute, usually reaching or nearly reaching the costa on the abaxial side, the tip usually strongly involute. **Fertile pinnae** with green tissue extending only slightly beyond the attachment of the indusium.

In open, often wet, sites, usually in the puna, grasslands, steep roadside banks, among rocks or in the crevices of rocks, 1750–4100 m, Lambayeque south to Puno.

Costa Rica and Panama; Venezuela and Colombia, south to Bolivia.

The stem is stout but only rarely (to ca. 2 m tall) arborescent. It is usually soft, mucilaginous and green inside, especially at the apex. Except for *B. auratum* var. *columbiense*, this species is distinctive among those of Peru in having very narrow sterile pinnae as well as fertile ones.

Lambayeque: Dist. Incahuasi, *Sagástegui et al.* 12781 (F, GH, HUT). **Cajamarca:** Prov. Hualgayoc, Carmona. *Soukup* 5011 (US). **Amazonas:** Paso de Calla-Calla, *Sanchez* 87 (GH). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young & Watson* 3499 (USM), 4400 (F, USM). **La Libertad:** Prov. Bolívar, Laguna de los Ichus, *López & Sagástegui* 3237 (GH). Prov. Santiago de Chuco, Dist. Mollepata, *Saunders* 875 (GH). Prov. Santiago de Chuco, Shoreyo-Trujillo, *Smith* 2344 (F). **Ancash:** NW slope of Nevada de Huascarán, *Correll & Smith* P958 (GH). Prov. Pallasca, Consuzo, *López* 2394 (GH). Huascarán National Park, *D. Smith* 10613, *Smith et al.* 10380 (F), 11627 (F, HUT), 12395, 12457 (F). **Huánuco:** Mito, *Bryan* 203 (F), *Macbride & Featherstone* 1790 (F, US), 2179 (F, US). **Junín:** Huancayo, *Kunkel* 425 (GH). **Huancavelica:** Prov. Tayacaja, entre Colcabamba y Paucartambo, *Tovar* 2005 (GH). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith* 23258 (F, US). **Apurímac:** Prov. Andahuaylas, Dist. Chincheros, *Saunders* 736 (GH). **Cuzco:** Prov. La Convención, Dist. Vilcabamba, *Davis et al.* 1217 (F, GH). **Puno:** Agapata, *Lechler* 2025, in part (GH). Near Puno, *Soukup* 218 (F).

16. *Blechnum sprucei* C. Chr., Index fil. 160. 1905, *nom. nov.* for *Lomaria caudata* Baker, not *Blechnum caudatum* Cav., 1802.

Lomaria caudata Baker, in Hooker & Baker, Syn. fil. 179. 1967. TYPE: Andes of Ecuador, *Spruce* 5329 (holotype, K, photo, Svensk Bot. Tidskr. 420. 1954).

Stem rather stout, nearly erect to decumbent and very short-creeping. **Leaves** dimorphic. **Pet-**

iole with basal scales few to many, rather large, concolorous, lanceolate to lanceolate-ovate or broader, stem scales light to dark brown often with lighter margins. **Sterile lamina** 1-pinnate, the apex gradually reduced, much prolonged with small pinnae and with 1 or more proliferous buds (always?), the base gradually reduced, pinnae strictly patent, sessile, truncate or often somewhat biauriculate, the margins flat, distant from the costa. **Fertile pinnae** with green tissue extending hardly or only slightly beyond the attachment of the indusium.

Undoubtedly in Peru.

Costa Rica; Ecuador; Peru south to northwest Argentina and east to southeast Brazil.

The much prolonged apex of the sterile lamina makes this a very distinctive species.

17. *Blechnum schomburgkii* (Klotzsch) C. Chr., Index fil. 157. 1905.

Lomaria schomburgkii Klotzsch, Linnaea 20: 346. 1847. TYPE: "British Guiana," *Schomburgk* 1162 (B).

Stem stout, arborescent to 3 m tall, to decumbent. **Leaves** dimorphic. **Petiole** with basal scales very numerous, long (to 3.5 cm or more), acicular, the base usually broader, curved, mostly bicolorous with a blackish or dark center and lighter, brown margins, stem scales dark brown or with lighter margins or light brown or brown. **Sterile lamina** 1-pinnate or pinnatisect distally, the apex abruptly reduced to a large, entire segment, the base hardly to somewhat reduced, the pinnae patent to somewhat ascending, sessile to short-stalked or partly adnate distally, cuneate, truncate, broadly rounded to cordate, the margins flat to involute, distant from the costa. **Fertile pinnae** with green tissue extending hardly or only slightly beyond the attachment of the indusium.

Usually terrestrial, rarely rupestral, cloud forests and elfin forests, or in open sites, seepage slopes, grassy hillsides, or at the edge of rocks, 1450–3400 m, Cajamarca south to Cuzco.

Costa Rica; Venezuela (Roraima) west to Colombia, south to Bolivia; southeastern Brazil.

The leaves are often few and the pinnae are acute to long-acuminate, and the tip is flat or nearly so.

Cajamarca: Namora, *Correll & Smith* P897 (GH). **Amazonas:** Prov. Chachapoyas, entre Leimebamba y Balsas, *López et al.* 4446 (GH). Prov. Bongará, 3 km S

of Pomacocha, *Wurdack* 998 (F, GH). **La Libertad:** Prov. Bolívar, Chomparen, *López & Sagástegui* 3207 (GH). **Huánuco:** SW slope of Río Llullapichis watershed, ascent of Cerros del Sira, *Dudley* 13417A (GH), 13467 (GH), 13469 (GH). Mito, *Macbride* 3408 (F). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley* 10975 (GH), 11118 (GH), 11135 (GH, MO).

18. ***Blechnum auratum*** (Fée) Tryon & Stolze, *comb. nov.*

Stem arborescent, often to ca. 1 m tall, sometimes multicapetal, stout. **Leaves** dimorphic or monomorphic. **Petiole** with basal scales usually many, to 3.5 cm long, curved, acicular beyond the usually broader base, bicolorous with a blackish center and lighter margins, or concolorous, brown, stem scales long, narrow, dark brown to blackish or center so but narrow margins lighter. **Sterile**

lamina 1-pinnate or pinnatisect distally, the apex abruptly reduced to a large, entire terminal segment, the base not or hardly reduced, to gradually reduced to rather small pinnae, pinnae usually strongly ascending, a few distal ones partly to fully adnate, others sessile to short-stalked, cuneate to broadly rounded to cordate. **Fertile pinnae** with green tissue extending hardly or only slightly beyond the attachment of the indusium.

Costa Rica; Venezuela and Colombia; south to Bolivia.

The stem is arborescent with a dense crown of stiffly straight leaves, the pinnae are strongly ascending to rarely only slightly so, and their apex is more or less obtuse, with the tip involute or rarely only slightly involute.

Key to Subspecies of *Blechnum auratum*

- a. Leaves dimorphic, the sterile pinnae broader than the fertile ones; margins of the sterile pinnae involute but not to the costa abaxially ssp. *auratum*
- a. Leaves monomorphic, the fertile and sterile pinnae of essentially the same width; margins of the sterile pinnae very strongly involute, reaching to or nearly to the costa abaxially ... ssp. *columbiense*

18a. ***Blechnum auratum* ssp. *auratum*.**

Lomaria aurata Fée, *Mém. foug.* 8: 71. 1857. TYPE: Colombia, Ocaña, *Schlim* 394 (holotype, P?).
Blechnum buchtienii Rosenst., *Repert. Spec. Nov. Regni Veg.* 5: 231. 1908. TYPE: Bolivia, Unduavi, *Buchtien* 878 (holotype, not located; isotype, US).

In open sites, wet hillsides, grasslands, rocky ground, and boggy places, 1900–3400 m. Piura south to Puno.

Range of the species.

Piura: Prov. Huancabamba, above Huancabamba, *Hutchison* 1620 (GH). **Amazonas:** Prov. Bongará, Dist. Yambasbamba, *Tillet* 673-340 (GH, USM). Balsas to Leimebamba, Barro Negro, *E. E. Smith* (habitat photo, GH). **San Martín:** Río Abiseo National Park, *Young* 1981 (HUT, USM). Prov. Chachapoyas, south side of Molinopampa–Disan pass, *Wurdack* 1614 (USM). **Pasco:** Prov. Oxapampa, Santa Barbara, *D. Smith* 8102 (F). **Junín:** Prov. Satipo, Dist. Pampa Hermosa, *Saunders* 1030 (GH), 1066 (GH). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley* 11031 (GH). Prov. Urubamba, near Sayacmarco, *Peyton & Peyton* 290 (GH). Paucartambo, *Soukup* 375 (F). Tres Cruces, *Gentry et al.* 23440 (F). **Puno:** Prov. Sandía, *Vargas* 14856 (GH). Prov. Sandía, near Limbani, *Metcalfe* 30519 (GH).

Blechnum columbiense Hieron., *Hedwigia* 47: 244, t. 5, f. 17. 1908. TYPE: Colombia, Huila, Páramo de Moras, *Stübel* 1268 (holotype, B).
Blechnum columbiense var. *bogotense* Hieron., *Hedwigia loc. cit.* 244. 1908. SYNTYPES: Colombia, Bogotá, *Karsten* (B), *Lindig* 27 (B); isosynotype, *Lindig* 27 (BM; photo, GH).

Elfin forests and jalca, 2700–3300 m, Piura and Amazonas. Venezuela and Colombia, south to Peru.

D. Smith 7720 (USM), Dept. Pasco, is this variety or near it.

Piura: Prov. Huancabamba, *Hutchison* 1619 (F, GH). **Amazonas:** 20 km downstream from Balsas, *Madison* 1138 (GH). La Jalca, Chachapoyas, *Ll. Williams* 7570 (F).

19. ***Blechnum obtusifolium*** Ettingsh., *Denkschr. Kaiserl. Akad. Wiss. Wien.* 23: 59, t. 8, f. 4. 1864. Also Ettingsh., *Farnkr. Jetzw.* 122. 1865.

Lomaria obtusifolia Presl, *Tent. Pterid.* 143. 1836, *nom. nud.* Since Ettingshausen uses Presl's name, the specimen cited by Presl, "Herb. bras. reg. berol. 101" may be considered to be the type (not located).

Stem more or less erect, massive, becoming arborescent. **Leaves** dimorphic. **Petiole** with basal

scales very numerous, long (to 3.5 cm or more), acicular beyond a usually broader base, usually bicolorous with a blackish center and lighter, brown margins, or mostly concolorous, brown, stem scales very long and narrow, often curved, attenuate, brownish often with dark brown to blackish center. **Sterile lamina** pinnatisect distally, 1-pinnate proximally, the apex abruptly reduced to an entire, usually large terminal segment, the base gradually reduced to small pinnae or lobes, pinnae patent to ascending, sessile with a cuneate to rounded base proximally or broadly sessile or partly adnate there, margins flat to somewhat involute, distant from the costa. **Fertile pinnae** with green tissue extending hardly or only slightly beyond the attachment of the indusium.

The status and nomenclature of this species are uncertain, the group of species related to *Blechnum magellanicum* being in need of revision. The description of Ettingshausen is not wholly satisfactory; additional characters are mentioned by Christ, Bull. Herb. Boissier 2, 4: 1091. 1904, and also by Hieronymus, Hedwigia 47: 243. 1908.

Two collections, wet forest and forest border, 550 and 220 m, Cuzco, and Madre de Dios.

Peru and northwestern Argentina; southeastern Brazil; range uncertain.

Cuzco: Prov. Paucartambo, Pillawata, Vargas 16698 (GH). **Madre de Dios:** Prov. Manú, Shintuya, Chávez 834 (fertile), 835 (sterile) (MO).

Comments

One collection of what may be a new species of subgenus *Blechnum* has not been identified: Amazonas, Prov. Bagua, Cordillera Colán, Barbour 3589 (MO). The specimen is evidently the central portion of a large fertile leaf. The long and narrow fertile pinnae are short-stalked and bear costal sori with expanded green tissue well beyond the attachment of the indusium.

The following names have not been associated with a Peruvian species of *Blechnum* for the reasons stated.

Blechnum ciliatum Presl, Reliq. Haenk. 1: 50. 1825. "Hab. in Peruvia et in Cordilleris Chilensibus." Under *Parablechnum ciliatum* (Presl) Presl,

Epim. bot. 109. 1851, only Chile is cited. Placed by Murillo (1968) as a synonym of *Blechnum auriculatum* Cav.

Blechnum cognatum Presl, Epim. bot. 107. 1851. "Habitat in vallibus Cordillerae Peruviae (Haenke)." Murillo (1968) places this name, *ex char.* as a synonym of *Blechnum occidentale* L.

Blechnum delicatum Maxon & Morton, Bull. Torrey Bot. Club 66: 41. 1939. TYPE: Roboré, Bolivia, Cardenas 3006 (holotype, US!) This seems to be an unusual variation of *Blechnum asplenoides*.

Blechnum lechleri Mett., Fil. Lechl. 2: 17. 1859. "Peruvia, Tatanara; Brasilia (Bongard)." I have not examined authentic material of this species. It may be *Blechnum cordatum*.

Lomaria linariaefolia Presl, Reliq. Haenk. 1: op. cit. 52. 1825. "Hab. in Peruviae?"

Blechnum malacothrix Maxon & Morton, Bull. Torrey Bot. Club 66: 40. 1939. TYPE: Okara, Cordillera Real, Bolivia, Tate 951 (holotype, NY; isotype, US!). This may be a valid species, or it may be *Blechnum confluens*.

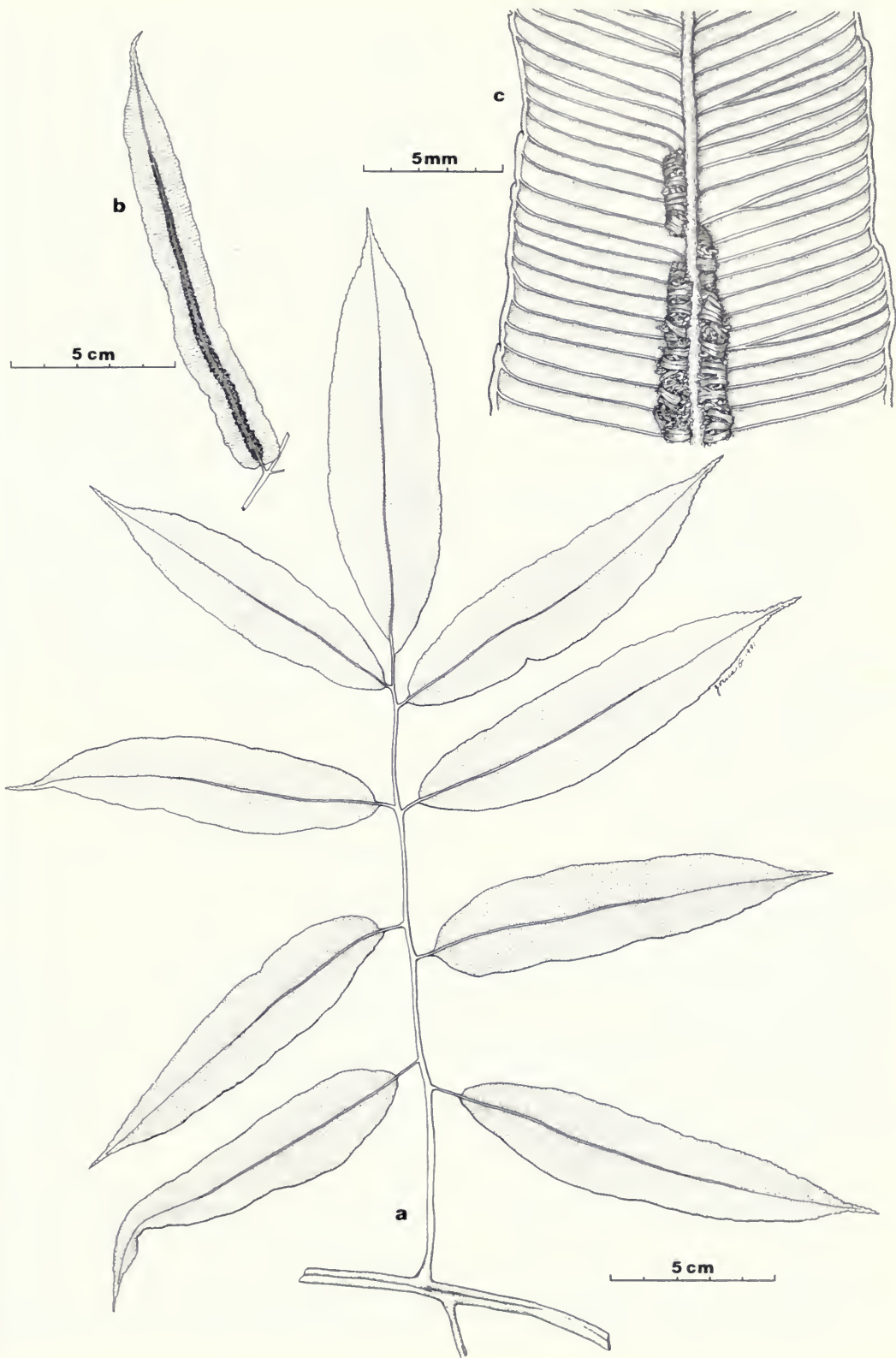
Blechnum trilobum Presl, loc. cit., t. 9, f. 2. 1825. "Hab. in Peruvia." The figure is *Blechnum auriculatum* Cav. of Chila NE to southern Brazil.

II. *Salpichlaena*

Salpichlaena Hooker, Gen. fil., t. 93. 1842, as *Salpichloena* in text, corrected in index. TYPE: *Salpichlaena volubilis* (Kaulf.) Hooker (*Blechnum volubile* Kaulf.). **Figure 4.**

Terrestrial. **Stem** long-creeping to short-creeping and moderately stout. **Leaves** dimorphic or partly dimorphic, the fertile pinnae with narrower, sometimes very narrow segments, scrambling or climbing to 15 m or more long, indeterminate. **Lamina** 2-pinnate, the pinnae imparipinnate. **Veins** free, connected by a marginal strand. **Sori** on a long vascular commissure close to the costa, not paraphysate, covered by an indusium of similar extent, arching completely over the sporangia, and opening toward the costa. **Spores** ellipsoidal, monolete, with spherical deposit over the papillate-rugose surface.

FIG. 4. *Salpichlaena volubilis*: a, sterile pinna; b, fertile pinnule; c, section of pinnule with sori. (From Plowman 2550, f.)



Salpichlaena is a widely distributed tropical American genus of one species. The leaves of juvenile plants are entire or 1-pinnate, and determinate, while those of adult plants are 2-pinnate, indeterminate, and scrambling or high-climbing in trees.

1. *Salpichlaena volubilis* (Kaulf.) Hooker, Gen. fil., t. 93. 1842. **Figure 4.**

Blechnum volubile Kaulf., Enum. fil. 159. 1824. TYPE: perhaps Brazil, *Chamisso* (holotype, LZ, destroyed; no isotype located).

Blechnum scandens Bory, in Duperrey, Voy. Coquille Bot. 272, t. 36. 1829. TYPE: Brazil, St. Catharina, *D'Urville* (holotype, P; isotype, GH!).

Lomaria volubilis Hooker, Sp. fil. 3: 39. 1860. TYPE: Brazil, Barra do Rio Negro, *Spruce 1263* (holotype, K; isotype, ? , GH!).

Blechnum volubile var. *lomarioideum* Baker in Martius, Fl. Brasil. 1(2): 428. 1870.

Spicanta hookeriana O. Kuntze, Revis. gen. pl. 821. 1891. *Nom. nov. for Lomaria volubilis* Hook. and with the same type.

Salpichlaena hookeriana (O. Kuntze) Alston, Bull. Misc. In form 1432: 312.

Salpichlaena lomarioidea (Baker) A. R. Sm., Ann. Missouri Bot. Gard. 77: 250. 1990.

Stem scales small, rigid, dark brown to blackish. **Pinnae** usually subopposite. **Segments** acute, narrowly acuminate to caudate, entire or often serrate at the tip, sessile to rather long-stalked, cuneate to broadly rounded at the base, the margins cartilaginous, the costa prominently abaxially, the sterile ones ca. 1.5 mm to 3 cm broad and 10–30 cm long. **Sori** costal, very long.

Terrestrial in rain forests, montane forests, inundated thickets and forests near rivers, rarely in cloud forests, 100–1900 m, mostly below 700 m, Amazonas and especially Loreto, south to Cuzco.

Central America; Lesser Antilles; south to Bolivia and southeastern Brazil.

The chromosome number of $n = 40$ is unique in the family. This is a very distinctive genus and species, with a long scrambling or climbing leaf. The habit is the same as that of *Lygodium* species. Rarely the fertile and sterile segments are of essentially the same breadth. It is probably more widely distributed than the collections indicated since the climbing leaves may be partly concealed among tree branches, or the plant may not be recognized as a fern.

In some specimens, the fertile segments are very narrow, with little or no green tissue extending beyond the attachment of the indusium. These

have been named *Salpichlaena hookeriana*—for example, *Plowman 2550* and *McDaniel 11758*, both Dept. Loreto (GH), are this narrow variant. Some specimens have narrow segments and only narrow green tissue beyond the indusium. Buds may be present in the axils of the pinnae (less often the axils of the pinnules), and these occur both in specimens with narrow and broad fertile segments. The narrow variant seems restricted to low elevations, while the specimens with broader segments are also from higher elevations. Further study is required before another taxon is recognized with confidence.

Amazonas: Río Marañón, above Cascadas de Mayasi, *Wurdack 1893* (F, GH). Prov. Bagua, 12 km E of La Peca, *Barbour 2402* (F, MO). E of La Peca, *Gentry et al. 22905* (F, USM). **San Martín:** Zepelacio near Moyobamba, *Klug 3514* (F, GH, MO). Prov. Mariscal Cáceres, Dist. Tocache Nuevo, *J. Schunke V. 5541* (F, MO), *7019* (F, USM). **Loreto:** Sierra del Pongo, *Mexia 6276* (F, GH, MO). Pumayacu, *Klug 3197* (F, GH, MO). Shirirara, Río Nanay, *Plowman 2550* (F, GH). Versailles, Iquitos, *McDaniel 11758* (F, GH, MO). **Huánuco:** Tingo María, *Allard 21386* (GH). **Pasco:** Prov. Oxapampa, Río Pichis, 1 hr below Puerto Bermúdez, *Gentry et al. 42123* (F). Prov. Oxapampa, N of Chequitavo, *D. Smith 5118* (MO). **Junín:** La Merced, *Soukup 1106* (F). Near La Merced, *Killip & Smith 23923* (F). Above San Ramón, *Killip & Smith 25565* (F). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley 10451* (GH, MO, USM).

Family 21. POLYPODIACEAE

POLYPODIACEAE Bercht. & J. S. Presl, Priroz-en. Rostlin 1: 272. 1820. TYPE: *Polypodium* L.

Stem erect to short-creeping, or very long-creeping, small to rather stout, or slender to filiform, with scales. **Leaves** ca. 3 cm to 2 m long, circinate in vernation, monomorphic or dimorphic, entire, pinnatifid, or variously forked, or pinnate, glabrous, pubescent or scaly abaxially. **Petiole** lacking stipules, often articulate to the stem. **Veins** free to anastomosing. **Sori** abaxial, round to elongate, borne on a vein, at the tip of a vein, at the junction of veins, on a vascular commissure, or on a special series of fertile veins, exindusiate, paraphysate or not. **Sporangia** with a 1- or 2-rowed stalk basally, the vertical annulus interrupted by the stalk.

The Polypodiaceae are a large family of perhaps 40 genera and 1000 species, most of these being

epiphytic or epipetric. The classification of this group is difficult, and authors often disagree on the taxa to be recognized and their rank. Three tribes are adopted here, each of these sometimes being treated as a family.

The tribe **Polypodiace** usually has the petiole sulcate and articulate to the stem, the petiole and lamina have short trichomes or none, the sporangium has two rows of cells at its base, and the spores are ellipsoidal, monolete and only rarely green. There are nine genera in Peru.

The tribe **Loxogrammeae** is intermediate between the two other tribes, having some characters of one and some of the other. It does not occur in Peru.

The tribe **Grammitideae** usually has the petiole

terete and continuous (not articulate) with the stem, the petiole and lamina often with long trichomes, the sporangium has a single row of cells at its base, and the spores are usually green and usually tetrahedral-globose, trilete. It is represented in Peru by the single genus, *Grammitis*.

References

COPELAND, E. B. 1947. *Polypodiaceae*, pp. 174–222. In *Genera Filicum*. Chronica Botanica, Waltham, Mass.
TRYON, R. M., AND TRYON. 1982. *Polypodiaceae*, pp. 684–758. In *Ferns and Allied Plants*. Springer-Verlag, New York.

Key to Genera of Polypodiaceae

- a. Petiole and usually the lamina with long, multicellular, acuminate trichomes; sporangium stalk uniseriate at base; spores usually with chlorophyll (green) and tetrahedral-globose . . . I. **Grammitis**
- a. Petiole and lamina without trichomes, or these present and usually unicellular, short; sporangium stalk bi- or triseriate; spores lacking chlorophyll (with rare exception), ellipsoidal, monolete b
- b. Lamina dichotomously or subdichotomously forked or veined c
- c. Lamina with scattered scales V. **Dicranoglossum**
- c. Lamina with stalked, stellate trichomes X. **Platyserium**
- b. Lamina entire, lobed, or pinnatifid to 3-pinnate d
- d. Stem bearing tubers; spores prominently echinate; epiphytic IX. **Solanopteris**
- d. Stem without tubers; spores nearly smooth, verrucate, rugose, tuberculate, papillate or with folds; terrestrial, rupestral, or epiphytic e
- e. Lamina pinnatifid, pinnatisect, or to 3-pinnate f
- f. Stem scales peltately attached III. **Polypodium**
- f. Stem scales basally attached II. **Pecluma**
- e. Lamina entire g
- g. Stem more or less flattened, its scales not clathrate, attached near the center VI. **Microgramma**
- g. Stem more or less terete, its scales usually clathrate h
- h. Sori in 2 rows between strong lateral veins, or lateral veins obscure or absent . . . i
- i. Immature sori with peltate paraphyses; most sori served by 2 or more veins; lamina surface scaly (at least sparsely so) IV. **Pleopeltis**
- i. Paraphyses absent or minute; most sori borne back of a single vein tip; scales absent on the lamina or only a few on the costa VII. **Campyloneurum**
- h. Sori in 1 row between strongly developed lateral veins j
- j. Stem very long-creeping III. **Polypodium**
- j. Stem more or less erect, decumbent or short-creeping VIII. **Niphidium**

Marginariopsis C. Chr. (Dansk. Bot. Ark. 6(3): 42. 1920) is an epiphyte that occurs from Ecuador north to Costa Rica and it may grow in Peru. Its stem is rather flattened and bears finely clathrate scales, the leaves are dimorphic, the fertile much narrower than the sterile, the lamina is entire, with

small scales, and the sporangia are borne on anastomosing veins.

Many American species of *Polypodium* have been placed in the genus *Goniophlebium*. That name, however, applies to an Old World genus and is typified by *Polypodium subauriculatum*

Blume (*Goniophlebium subauriculatum* (Blume) Presl).

(*Lellingeria apiculata* (Klotzsch) Smith & Moran).

I. Grammitis

Grammitis Sw., J. Bot. (Schrad.) 1800(2): 17. 1801.

TYPE: *Grammitis marginella* (Sw.) Sw. (*Polypodium marginellum* Sw.). **Figure 5.**

Xiphopteris Kaulf., Berl. Jahrb. Pharm. 21: 35. 1820. LECTOTYPE (designated by John Sm., Hist. fil. 179. 1875: *Xiphopteris serrulata* (Sw.) Kaulf. *Grammitis* section *Xiphopteris* (Kaulf.) Presl, Tent. Pterid. 208. 1836.

Cochlidium Kaulf., Berl. Jahrb. Pharm. 21: 36. 1820. TYPE: *Grammitis graminoides* (Sw.) Sw. (*Acrostichum graminoides* Sw., *Cochlidium graminoides* (Sw.) Kaulf.) (section *Pleurogramme*).

Ctenopteris Kunze, Bot. Zeit. (Berlin) 4: 425. 1846. TYPE: *Ctenopteris venulosa* (Blume) Kunze (*Polypodium venulosum* Blume = *Grammitis venulosa* (Blume) R. & A. Tryon (section *Cryptosorus*).

Cryptosorus Fée, Mém. foug. 5 (Gen. fil.): 231. 1852: TYPE: *Cryptosorus blumei* Fée, nom. superfl. for *Polypodium obliquatum* Blume = *Grammitis obliquata* (Blume) Hassk. *Polypodium* section *Cryptosorus* (Fée) Fourn., Ann. Sci. Nat. Bot., ser. 5, 18: 282. 1873. *Grammitis* section *Cryptosorus* (Fée) R. & A. Tryon, Rhodora 84: 128. 1982.

Glyphotaenium (John sm.) John Sm., Hist. fil. 187. 1875. *Ctenopteris* subgenus *Glyphotaenium* John Sm., Bot. Voy. Herald (Seemann) 227. 1854. TYPE: *Ctenopteris crispata* John Sm. (*Glyphotaenium crispatum* (John Sm.) John Sm.) = *Grammitis crispata* (John Sm.) Morton. *Grammitis* section *Glyphotaenium* (John Sm.) R. & A. Tryon, Rhodora 84: 128. 1982.

Enterosora Baker, Timehri 5: 218. 1886. TYPE: *Enterosora campbellii* Baker = *Grammitis campbellii* (Baker) Proctor (section *Glyphotaenium*).

Micropolypodium Hayata, Bot. Mag. Tokyo 42: 302, 341. 1928. TYPE: *Micropolypodium pseudotrichomanoides* (Hayata) Hayata.

Ceradenia Bishop, Amer. Fern J. 78: 2. 1988. TYPE: *Polypodium curvatum* Sw. (*Ceradenia curvata*) (Sw.) Bishop) = *Grammitis curvata* (Sw.) Ching.

Zygophlebia Bishop, Amer. Fern J. 79: 107. 1989. TYPE: *Polypodium sectifrons* Mett. (*Zygophlebia sectifrons* (Mett.) Bishop) = *Grammitis sectifrons* (Mett.) Seymour.

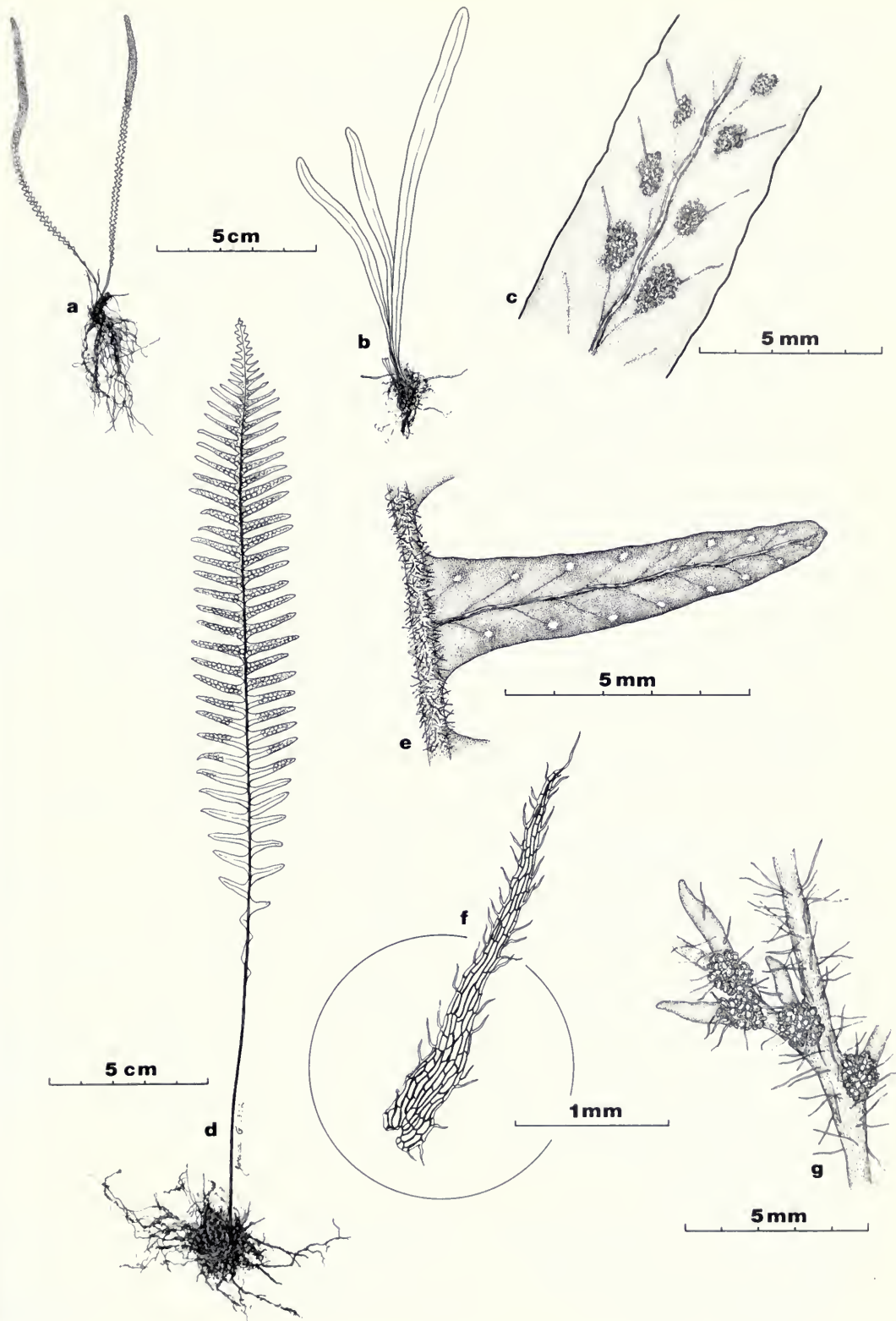
Lellingeria Smith & Moran, Amer. Fern J. 81: 76. 1991. TYPE: *Polypodium apiculatum* Klotzsch

Plants commonly epiphytic, occasionally epipetric or terrestrial. **Stem** small, mostly short-creeping, sometimes erect, commonly scaly (scales clathrate or not), rarely naked, bearing slender, fibrous roots. **Leaves** monomorphic or rarely the apical fertile portion modified, 2–60 cm (rarely to 1 m) long, rarely articulate to the stem, scales lacking, or present only at petiole base, petiole long to obsolete. **Lamina** simple and entire to pinnatisect (very rarely to 3-pinnate), glabrous or variously pubescent (rarely densely so), the trichomes 1–few-celled. **Veins** commonly free, sometimes anastomosing and with or without free, included veinlets. **Sori** round to elongate, sometimes confluent, borne on the vein or vein branch, sometimes deeply immersed in the laminar tissue, or sporangia in lines on each side of the costa, paraphysate or not, exindusiate. **Spores** trilete, tetrahedral-globose, greenish (chlorophyllous).

Grammitis is a pantropical and austral genus of more than 400 species, with perhaps half of these in America. From the time of Copeland's (1947) "Genera Filicum" to the present it has been divided by various authors into as many as 20 genera or subgenera, and some of these divisions may be warranted. Alan R. Smith and Robbin C. Moran are currently attempting a revision of the American species that will recognize nine genera, the concepts partially based on the recent work of Bishop (1977, 1978, 1988, 1989a). The authors have kindly provided provisional manuscripts of these genera, which have been very helpful in constructing a key to the species in Peru. Nevertheless, pending the results of these new studies, *Grammitis* is recognized in the broadest sense for purposes of the present treatment.

The key to species in Peru is based in part on the generic divisions ultimately to be proposed by Smith and Moran. For example, species 1–3 are *Grammitis* s.s., essentially defined in the Neotropics by the dark, sclerenchymatous border of the lamina, and species 7–9 share the characters of *Enterosora* (= *Glyphotaenium*): lamina subcar-

FIG. 5. *Grammitis myosuroides*: a, habit. *Grammitis limbata*: b, habit; c, leaf section, with sori. *Grammitis david-smithii*: d, habit; e, pinna, adaxial side; f, stem scale. *Grammitis myriophylla*: g, section of rachis with fertile pinna base. (a from Camp E-5131, Ecuador, F; b from Steyermark & Wurdack 1178, Venezuela, F; c from D. Smith 2038, F; d from Beck 1424A, Bolivia, F; e, f from Smith & Canne 5837, holotype, F; g from León 1005, F.)



nose and entire to lobed, with sori immersed in the tissue, hydathodes lacking.

The character of hydathodes is effective in separating some major species groups, in addition to *Glyphotaenium*. In many species, hydathodes are easily visible to the naked eye—usually seen as expanded vein tips differing in color from the adjacent tissue. In other species, closer scrutiny is necessary; i.e., hydathodes may be hidden by dense indument, or they may be located at the very segment margin, the adaxial portion of which is strongly revolute, or they may be less conspicuous to the naked eye, yet quite evident with slight magnification (10–12×).

Besides the group of *Enterosora*, two other anhydathodous groups are to be recognized by Smith and Moran, these separated by a presumably good and consistent character: sori with conspicuous, pale, waxlike paraphyses (*Ceradenia*) vs. paraphyses lacking, or dark and not waxlike (*Zygophlebia*). Unfortunately, the presence and character of the paraphyses often cannot be ascertained in mature sori nor in heat-dried specimens (Bishop, 1988, p. 2). Species of *Zygophlebia* are further characterized by strongly to casually anastomosing veins (free in *Ceradenia*), but in two of three species in Peru (*G. dudleyi*, *G. werffii*) the lamina texture is so thick that veins can only be examined by the lengthy process of clearing. Thus, the two most important distinguishing features of these two groups are in most cases functionally ineffective insofar as rapid field or herbarium identification is concerned.

Species 29–66, with hydathodes, are much more difficult to separate into discrete groups; however, the characters used in the key that best seem to indicate species relations are those of stem scales, laminar trichomes, and sporangia (capsular setae present or lacking).

Several species complexes in this treatment are still very poorly understood, and relationships of their components are sorely in need of study. The groups most in need of attention are those of *G. cultrata/heteromorpha*, *G. semihirsuta*, *G. moniliformis*, and *G. flabelliformis/pilosissima*, each of these probably containing four to eight taxa. The species delineations herein seem to serve rather

well insofar as Peruvian collections are concerned, but many of the taxa vary or intergrade considerably in Mexico and Central America, the West Indies, and other parts of South America. Most of the problems are pointed out in the respective species discussions that follow.

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Key to Species of *Grammitis*

- a. Lamina simple, entire, with a black or dark brown, sclerenchymatous border b
- b. Lamina less than 3 mm broad; stem scales 2–6 cells across at base 3. *G. paramicola*
- b. Lamina 3–8 mm broad; stem scales 8–12 cells across at base c
- c. Hydathodes present; sclerenchymatous border commonly less than 0.1 mm broad; lamina firm-herbaceous to chartaceous 2. *G. limbata*

- c. Hydathodes lacking; border commonly 0.2 mm broad; lamina subcoriaceous 1. *G. bryophila*
- a. Lamina lobed to decompound or, if simple, then lacking a dark, sclerenchymatous border d
- d. Lamina (at least fertile portions) simple and subentire to repand or serrate-dentate, 1–2 mm broad, the sori confluent and commonly covering the costa at maturity e
- e. Leaves monomorphic, fertile and sterile portions entire throughout, ca. 1 mm broad 4. *G. pumila*
- e. Leaves partly dimorphic, fertile distal portion subentire, sterile leaf or portion serrate-dentate to pinnatisect, to 4 mm broad f
- f. Lamina trichomes castaneous, scattered but persistent at least on costa and veins; sporangia borne at base of veins, confluent as 2 subcostal lines until merging into a broad single line at full maturity; sterile portion of lamina pennatisect 5. *G. myosuroides*
- f. Lamina trichomes lacking (or pale and caducous on juvenile plants); sporangia borne on costa and veins, thus confluent as a single, costal line; sterile portion of lamina serrate-dentate or with short, acute lobes 6. *G. serrulata*
- d. Lamina pinnatisect to decompound throughout, or if simple to shallowly lobed then 4–20 mm broad and sori discrete, in 1 or more lines on each side of, and subdistant from, the costa ... g
- g. Hydathodes lacking, or minute and discernible only with high (more than 20×) magnification h
- h. Lamina simple, subentire or lobed to pinnatifid (not cut nearly to the costa) i
- i. Leaves 1–3.5 cm broad; stem scales yellow or yellowish brown; sori in (1–)2–5 series between costa and margin j
- j. Leaves 2–3.5 cm broad, cut $\frac{1}{3}$ – $\frac{1}{2}$ to the costa; petiole lustrous black or atropurpureous; sori in 3–5 series between costa and margin 7. *G. trifurcata*
- j. Leaves 1–1.5 cm broad, subentire to very shallowly lobed; petiole dull yellowish or reddish brown; sori in (1–)2 series between costa and margin 8. *G. trichosora*
- i. Leaves 0.4–0.8 cm broad; stem scales deep orange to castaneous; sori in a single series between costa and margin k
- k. Stem scales deep orange, entire or remotely ciliolate; lamina base attenuate; petiole trichomes castaneous 9. *G. parietina*
- k. Stem scales castaneous, conspicuously setose; lamina base cuneate; petiole trichomes orange 10. *G. phalacron*
- h. Lamina pinnatisect (cut nearly to the costa) to 3-pinnate l
- l. Lamina 2–3-pinnate; ultimate segments 0.7–3 mm long m
- m. Stem scales clathrate, margins entire or with some short glands near apex; petiole and lamina puberulent, but lacking long, spreading, castaneous trichomes 24. *G. mirabilis*
- m. Stem scales nonclathrate, margins abundantly setose; petiole and lamina with spreading castaneous trichomes to 1.5 mm long (and puberulent as well) 28. *G. bipinnata*
- l. Lamina 1-pinnate or deeply pinnatisect; ultimate segments 5 mm long or (usually) much longer n
- n. Veins regularly merging to form usually quite evident areoles, at least when held to light 25. *G. mathewsii*
- n. Veins free, or, if casually anastomosing, then completely obscure, even when held to light o
- o. Lamina not or scarcely reduced at base, or basal pair of segments more than half as long as median ones; petiole about half as long as or longer than the lamina p
- p. Pinnae, at least proximal ones, deeply serrate, the others crenulate 11. *G. longipinnata*
- p. Pinnae subentire q
- q. Stem scales rather flaccid, pale orange or yellow-brown, entire, lacking marginal setae; plants epiphytic 26. *G. dudleyi*

- q. Stem scales rigid, deep orange to castaneous, with conspicuous marginal setae; plants terrestrial r
- r. Rachis and costae (and usually segments) amply provided on both sides with long, spreading trichomes, these 0.5–2 mm long 12. *G. meridensis*
- r. Rachis (and usually costae) densely short-puberulent adaxially, the trichomes 0.1–0.3(–0.4) mm long s
- s. Setae of stem scales dark, the same color as the scale body; stem long-creeping, the leaves mostly wide spaced 13. *G. bishopii*
- s. Setae of stem scales whitish, in strong contrast with the dark scale body; stem short-creeping to ascending, leaves approximate or crowded ... 27. *G. werffii*
- o. Lamina somewhat to strongly reduced at base, several to many proximal segments much shorter than medial ones or reduced to mere auricles; petiole obsolete or much shorter than the lamina t
- t. Petiole lacking conspicuous, spreading trichomes u
- u. Petiole essentially obsolete; sclerenchyma of the rachis and costae obscured by the thick lamina tissue v
- v. Lamina segments 1–2 times as long as broad; lamina moderately to densely white-farinose, the farina mostly disposed in stellate patterns 14. *G. discolor*
- v. Lamina segments (larger ones) 3–7 times as long as broad; lamina moderately farinose to naked, the farina deposits solitary or in amorphous clusters 15. *G. curvata* ssp. *pearcei*
- u. Petiole (1–)2–10 cm long; sclerenchyma of the rachis (and sometimes costae) exposed, at least proximally w
- w. Lamina pinnatisect, segments closely spaced, joined by at least a narrow wing of tissue, gradually narrowing from longest medial pinnae to nearly auricular ones at base x
- x. Stem scales 3–5 mm long, setulose; segments ascending at a 30–50° angle; sori medial 16. *G. terrestris*
- x. Stem scales ca. 1 mm long, subentire; segments ascending at a 60–80° angle; sori supramedial 17. *G. herrerae*
- w. Lamina 1-pinnate, pinnae adnate, but discrete and mostly subdistant, abruptly reduced at base, with only ca. 3–6 pinnae shorter than medial ones y
- y. Pinnae 1–3.5 cm long, 2.5–5 mm broad, ascending at a 60–80° angle, base rounded to truncate acroscopically; sori generally confined within pinna margins 19. *G. farinosa*
- y. Pinnae to 10 cm long, ca. 1.5 mm broad, ascending at a 20–35° angle, attenuate at base; sori at maturity extending well beyond pinna margins 18. *G. dendrodoxa*
- t. Petiole (and often the rachis and lamina) amply provided with orange to castaneous, spreading, unicellular trichomes, these 0.5–3 mm long z
- z. Lamina 0.6–1 cm broad; pinnae circular, obovate or broadly oblong, obtuse at the apex, 1–2 times as long as broad 20. *G. congesta*
- z. Lamina 2–10 cm broad; pinnae linear to deltate, acute to attenuate at the apex, several to many times longer than broad a2
- a2. Pinna base rounded nearly to the costa acroscopically, short-decurrent basiscopically; sori not extending beyond the pinna margin 21. *G. praeclara*
- a2. Pinna base fully adnate and nearly perpendicular to the rachis acroscopically, long-decurrent basiscopically; sori mostly extending beyond the pinna margin at maturity b2

- b2. Lamina thin- to firm-herbaceous; rachis evident and usually lustrous, at least abaxially; petiole 0.2–0.4(–0.5) mm in diameter ... 22. *G. capillaris*
 - b2. Lamina subcarnose; sclerenchyma of the rachis usually obscured by laminar tissue, or rarely evident and then not lustrous; petiole (0.4–)0.6–0.9 mm in diameter ... 23. *G. pilipes*
 - g. Hydathodes evident (or in a few species hidden by dense trichomes) ... c2
 - c2. Trichomes on petiole and/or lamina 0.1–0.3 mm long or lacking and the stem scales conspicuously setose ... d2
 - d2. Lamina subtruncate at base, or a few proximal pairs of pinnae about half as long as medial ones ... 30. *G. apiculata*
 - d2. Lamina attenuate at base, 2–6 proximal pairs of pinnae rudimentary and auriculiform ... e2
 - e2. Rachis thin and conspicuously flexuous, sparsely puberulent adaxially; pinna base inequilateral, rounded or truncate acroscopically, decurrent basiscopically; pinnae ascending at a 20–45° angle ... 31. *G. pseudocapillaris*
 - e2. Rachis stout and rigid, not or slightly flexuous, densely puberulent adaxially; pinna base subequilateral, either subtruncate or dilated; pinnae patent or slightly ascending (often strongly ascending in *G. subsessilis*) ... f2
 - f2. Mature leaves 0.8–1.5 cm broad; petiole 0.3–0.4 mm in diameter; pinnae oblong, 3–4 times longer than broad ... 32. *G. tunguraguae*
 - f2. Mature leaves 2–7 cm broad; petiole (0.4–)0.5–1.2 mm in diameter; pinnae linear to deltate, 6–12 times longer than broad ... g2
 - g2. Pinnae often strongly ascending, linear from a strongly dilated base; stem scales 2–4 mm long, obviously clathrate, the proximal cells in 5–10 series across the scale and the lumina clear ... 33. *G. subsessilis*
 - g2. Pinnae patent to slightly ascending, deltate or oblong-deltate; stem scales (4–)5–7 mm long, narrowly clathrate, the proximal cells in (12–)15–20 series across the scale and the lumina mostly occluded ... 34. *G. major*
 - c2. Trichomes on petiole and/or lamina (0.4–)0.5–2 mm long or, if shorter or lacking, then stem scales entire ... h2
 - h2. Trichomes on petiole and/or lamina 0.1–0.3 mm long or lacking (occasionally a few, scattered, longer ones present, especially on the petiole in #40) ... i2
 - i2. Pinnae deeply lobed to pinnatifid, most of them ascending at a 30–45° angle ... 35. *G. gracilis*
 - i2. Pinnae with margins entire to crenulate, patent or slightly ascending ... j2
 - j2. Pinnae conspicuously inequilateral at base (i.e., broadly rounded to subauriculate acroscopically, strongly decurrent basiscopically); lamina thin-herbaceous ... 36. *G. phlegmaria*
 - j2. Pinnae subequilateral, equally dilated at base, or basiscopically somewhat more spreading; lamina chartaceous to coriaceous ... k2
 - k2. Pinnae or segments ascending at a 60–70° angle, linear-deltate, 6–8 times as long as broad ... 37. *G. youngii*
 - k2. Pinnae or segments patent, semicircular to oblong or deltate, 1–3(–4) times as long as broad ... 12
 - 12. Laminar tissue amply provided with appressed, whitish, viscid trichomes, these often obscuring the hydathodes 29. *G. jamesonioides*
 - 12. Laminar tissue essentially glabrous, the hydathodes conspicuous ... m2
 - m2. Stem scales 1–2(–2.5) mm long, not iridescent, cell walls blackish; segments plane ... 38. *G. melanosticta*
 - m2. Stem scales 3–8 mm long, iridescent, cell walls brown or reddish brown; segment margins (at least fertile ones) revolute ... n2

- n2. Leaves well spaced on the stem; segments 2–4 times as long as broad; plants not aromatic 39. *G. erecta*
 - n2. Leaves commonly approximate to subfasciculate; segments 1–1.5 times as long as broad; plants (especially dried) with a resinous scent 40. *G. moniliformis*
 - h2. Trichomes on petiole and/or lamina (0.4–)0.5–2 mm long o2
 - o2. Leaves 1-pinnate and 1–2-forked 50. *G. heteromorpha*
 - o2. Leaves pinnatisect to 2(–3)-pinnate, not (or very rarely) forked p2
 - p2. Pinnae crenate or lobed (at least near the base) to 1(–2)-pinnate q2
 - q2. Pinnae crenate to deeply lobed; stem scales black or dark brown 64. *G. athyrioides*
 - q2. Pinnae deeply pinnatisect to 1(–2)-pinnate; stem scales orange or light brown r2
 - r2. Ultimate segments linear; margins of stem scales entire or with a few short glands; sporangia not setose 65. *G. myriophylla*
 - r2. Ultimate segments oblong to nearly circular; margins of stem scales long-setose; sporangia long-setose s2
 - s2. Hydathodes commonly encrusted with white deposits; pale trichomes of rachis (and segments) mixed with castaneous, stellately branched ones 66. *G. immixta*
 - s2. Hydathodes lacking white encrustations; pale trichomes of rachis mixed with minute (0.1–0.3 mm), septate, gland-tipped ones 67. *G. variabilis*
 - p2. Pinnae (or segments) entire t2
 - t2. Sporangia with long setae; axes with most of the trichomes sericeous and hyaline to pale orange; stem scales setose u2
 - u2. Lamina deeply pinnatisect, not or scarcely reduced at base or only 1–2 basal pairs greatly reduced; petiole long, conspicuous 48. *G. asplenifolia*
 - u2. Lamina fully 1-pinnate, strongly and gradually reduced at base; petiole short or obsolete v2
 - v2. Rachis with stout, castaneous, sessile-stellate trichomes mixed among the simple, sericeous ones w2
 - w2. Pinnae 0.4–1 cm long, oblong-elliptic, obtuse, most of them narrowed at base; petiole 0.2–0.4 mm in diameter; sporangia each with 1 seta 49. *G. dependens*
 - w2. Pinnae 1.1–4.5 cm long, deltate, acute or subacute, broadly adnate at base; petiole 0.4–1 mm in diameter; sporangia with 1–3 setae 51b. *G. lanigera* var. *stella*
 - v2. Rachis lacking stout, castaneous, sessile-stellate trichomes (although some thin, pale, stellate ones may be present) x2
 - x2. Pinnae 3–6 mm long; pinna base very constricted and inequilateral, strongly rounded acroscopically, decurrent basiscopically 52. *G. subflabelliformis*
 - x2. Pinnae 10–45 mm long; pinna base broadly adnate and subequilateral, slightly rounded or truncate to somewhat dilated y2
 - y2. Pinnae 60–80 pairs, linear, 0.2–0.3 mm broad, 12–20 pairs along 5 cm of rachis; rachis trichomes all simple 53. *G. laxa*
 - y2. Pinnae 20–50 pairs, oblong to deltate, (0.3–)0.4–1.2 mm broad, 4–10 pairs along 5 cm of rachis; rachis with few to many sessile-stellate trichomes mixed among the abundant simple ones z2
 - z2. Most pinnae slightly deflexed; petiole 0.2–0.3 mm

- in diameter; lamina sparsely to moderately pilose; sessile-stellate trichomes sparse on rachis and abaxial surface 54. *G. cultrata*
- z2. Most pinnae patent to slightly ascending; petiole 0.4–1 mm in diameter; lamina densely pilose; simple and sessile-stellate trichomes everywhere abundant 51a. *G. lanigera* var. *lanigera*
- t2. Sporangia lacking long setae; axes with stout, rigid, trichomes (except sericeous in *G. taxifolia*), stem scales setose or not a3
- a3. Stem scales with few to many rigid, marginal setae, these often as long as the width of the scale body b3
- b3. Lamina of mature leaves to 1 cm broad; veins solitary in each segment and simple or with one acroscopic branch c3
- c3. Petiole 0.5–1.5 cm long; lamina chartaceous; segments often somewhat gibbous at base acroscopically 55. *G. blepharolepis*
- c3. Petiole obsolete or nearly so; lamina thin- to firm-herbaceous; segments not gibbous 56. *G. truncicola*
- b3. Lamina of mature leaves (1.5–)2–8(–12) cm broad; veins 3–many pairs in a pinna or segment d3
- d3. Stem scales gray-brown or black, clathrate or not; sori medial to inframedial e3
- e3. Stem scales gray-brown to blackish, essentially clathrate; lamina trichomes mostly 0.4–0.5 mm long; veins 6–14 pairs per segment; hydathodes lacking white deposits 57. *G. david-smithii*
- e3. Stem scales lustrous black, nonclathrate; lamina trichomes 1–2 mm long; veins 3–4 pairs per segment; hydathodes mostly encrusted with white deposits 58. *G. pichinchensis*
- d3. Stem scales orange to castaneous, not or scarcely clathrate; sori supramedial to submarginal f3
- f3. Pinna surface amply and minutely setulose abaxially; lamina not reduced at base, or with 1–3 pairs of pinnae somewhat shortened; rachis trichomes 0.4–0.7 mm long abaxially, shorter adaxially 59. *G. alsopeteris*
- f3. Pinna surface glabrous abaxially; lamina conspicuously reduced at base, 3–6 pairs of pinnae much shortened; rachis trichomes mostly 1–2 mm long (sometimes partly broken away on older leaves) g3
- g3. Pinnae broad- or oblong-deltate, obtuse to subacute, 4–6 times as long as broad; veins 6–13 pairs per pinna 60. *G. leucosticta*
- g3. Pinnae linear or linear-deltate, acute, 7–10 times as long as broad; veins 16–24 pairs on larger pinnae 61. *G. semihirsuta*
- a3. Stem scales with margins entire (scale apex setose in *G. taxifolia*) or minutely glandular or ciliate h3
- h3. Stem scales less than 1 mm long, few and inconspicuous; stems small (usually less than 1 mm), on long-creeping, stoloniform roots 41. *G. anfractuosa*
- h3. Stem scales (1–)2–8 mm long, conspicuous and usually in large masses at least at stem apex; stems 1–5 mm thick, roots not stoloniform i3
- i3. Stem scales conspicuously clathrate, gray-brown, narrow-

- deltate or -lanceolate, 8–15 cells across at scale base and the lumina large, clear and elongate j3
- j3. Pinnae linear and many of them deflexed, conspicuously inequilateral at base, strongly dilated acroscopically, subtruncate basiscopically; lamina (2–)3–7 cm broad; trichomes on rachis adaxially 0.3–0.5 mm long and persistent 42. **G. firma**
- j3. Pinnae oblong to narrow- or oblong-deltate, not deflexed, subequilaterally truncate or slightly dilated at base; lamina 0.4–2.5 cm broad; rachis trichomes 0.6–1 mm long (sometimes deciduous) k3
- k3. Pinnae ascending, acute; lamina not or abruptly reduced at base, proximal 0–3 pairs of pinnae somewhat shortened 43. **G. pilosissima**
- k3. Pinnae patent, obtuse or subacute; lamina strongly and gradually reduced at base, with 3–many pairs of pinnae much shortened 13
13. Pinnae mostly oblong, 2.5–6 times as long as broad; petiole amply provided with spreading, dark, unicellular trichomes, but minute, tortuous, septate ones rare or lacking; dried specimens strongly aromatic 44. **G. xiphopteroides**
13. Pinnae deltate or oblong-deltate, 1.5–2 times as long as broad; petiole moderately provided with minute, septate trichomes, but spreading, unicellular ones sparse or lacking; specimens not or weakly aromatic ... 45. **G. flabelliformis**
- i3. Stem scales not or obscurely clathrate, yellow to lustrous orange or reddish brown, or if gray-brown then ovate or broadly lanceolate and minutely clathrate, with 18–30 cells across at scale base and most lumina very small and nearly isodiametric m3
- m3. Stem scales flaccid and dull yellow in mass, with scattered, minute, marginal glands; sori solitary at segment base; petiole 0.5–2.5 cm long ... 62. **G. blepharidea**
- m3. Stem scales stout and bright orange to red-brown or thin and gray-brown, eglandular; sori 2–12 pairs on a pinna; petiole 3–10 cm long n3
- n3. Stem scales orange to red-brown, stout, rigid and lustrous, nonclathrate, terminating in a pale, apical (often deciduous) seta; rachis trichomes pale and sericeous 63. **G. taxifolia**
- n3. Stem scales light or gray-brown, thin, minutely clathrate, lacking an apical seta; rachis trichomes rigid and castaneous or lacking o3
- o3. Pinnae narrowly deltate or oblong-deltate, 4–8 times as long as broad, margins essentially plane, apex acute or subacute 46. **G. pseudonutans**
- o3. Pinnae oblong or broadly oblong-deltate, 1.5–2 times as long as broad, margins mostly revolute, apex obtuse (occasionally subacute) ... 47. **G. andicola**

1. *Grammitis bryophila* (Maxon) Seymour, *Phytologia* 31: 172. 1975.

Polypodium bryophilum Maxon, *Amer. Fern J.* 16: 7. 1926. TYPE: Costa Rica, Pcia. San José, vicinity of La Palma, *Maxon & Harvey 7980* (holotype, us!; photo, f).

Plants commonly epiphytic, rarely (and in Peru) terrestrial. **Stem** erect to ascending, provided with bright orange, lustrous, nonclathrate scales, these 1.5–3 mm long, to 0.5 mm broad, 8–12 cells across at the base. **Leaves** simple, entire, 4–25 cm long, 3–5 mm broad. **Petiole** dark brown to castaneous, 0–3 mm long, 0.2–0.8 mm in diameter. **Lamina** linear to narrow-elliptic or -oblanceolate, erect, subcoriaceous, attenuate at base, the apex acute to attenuate, provided with a lustrous, black or castaneous, sclerenchymatous border about 0.2 mm broad, essentially glabrous, but with scattered, minute, subclavate, caducous trichomes, especially on costa and margin. **Veins** indistinct, diverging from the costa at 30–40(–50)° angles, sterile ones simple, fertile ones forked, hydathodes lacking. **Sori** elongate, often slightly immersed, usually confluent at maturity.

In dwarf forest, in sphagnum, 2700 m, San Martín and Pasco.

Costa Rica; Panama; Venezuela; Colombia; Peru; Bolivia.

The two specimens cited below from San Martín are mounted on the same sheet at Kew, each with the small, blue, handwritten label characteristic of Spruce, and both are numbered 4643. It is assumed the number is correct for the Spruce specimen, since other specimens of his, collected near this date, bear numbers in this sequence. Apparently mounters inadvertently copied this number onto the Nelson label; this specimen may have come from Ecuador (see **Comments**).

San Martín: Mt. Picóte near Moyobamba, *Nelson* in Dec. 1856 (κ). Mt. Campana, near Tarapoto, *Spruce* 4643 in Aug. 1856 (κ). **Pasco:** Border between Provinces Pasco and Oxapampa, San "Cotardo" (Gutardo), *van der Werff et al.* 8584 (MO, UC).

2. *Grammitis limbata* Fée (Mém. foug. 5) Gen. fil.: 233. 1852. TYPE: Guadeloupe, *Perrotet*, in 1824 (holotype, p!). **Figures 5b–c.**

Grammitis nigrolimbata Hooker, *Sp. fil.* 4: 164. 1862. in *synon.*

Polypodium nigrolimbatum Jenman, *Bull. Bot. Dept.*, n.s. 4: 69. 1897.

Polypodium limbatum (Fée) Maxon, *Bull. Torrey Bot. Club* 42: 222. 1915.

Grammitis nigrolimbata (Jenman) Lell., *Proc. Biol. Soc. Wash.* 89: 715. 1977.

Plants terrestrial. **Stem** erect to ascending, provided with bright orange or golden orange, lustrous, rigid, nonclathrate scales, these 2–3 mm long, to 0.5 mm broad, 8–12 cells across at the base. **Leaves** simple, entire to weakly sinuate-undulate, 5–16 cm long, 3–8 mm broad. **Petiole** light brown, 1–5 mm long, 0.2–0.4 mm in diameter. **Lamina** linear to narrow-elliptic or -oblanceolate, erect, firm-herbaceous to chartaceous, attenuate at base, the apex acute or subacute, rarely apiculate, provided with a lustrous black or castaneous, sclerenchymatous border usually less than 0.1 mm broad, essentially glabrous but with scattered, minute, caducous trichomes, especially on costa and margin, these simple and subclavate, rarely branched. **Veins** distinct or indistinct, diverging from the costa at 30–40° angles, sterile ones simple, fertile ones commonly with a short spur bearing the sorus, hydathodes evident adaxially. **Sori** superficial, rounded to, usually, elongate, sometimes confluent.

In cloud forests, growing on trees, 750–910 m, Pasco and Cuzco.

West Indies; Venezuela; Peru; Bolivia; Brazil.

Pasco: Prov. Oxapampa, west divide of Cordillera de San Matías between Iscozacín and summit, *D. Smith* 2038 (F, MO). **Cuzco:** Prov. Paucartambo, Río Tono Road, *Foster et al.* 10619 (F).

3. *Grammitis paramicola* Bishop, *Amer. Fern J.* 67: 105. 1977. TYPE: Colombia, Depto. Huila, 25 km southeast of Gigante, *Little* 8663 (holotype, us!; photo, f).

Plants terrestrial. **Stem** erect to ascending, provided with deep orange, lustrous, rigid, nonclathrate scales, these 1–2 mm long, ca. 0.2–0.3 mm broad, 2–6 cells across at the base. **Leaves** simple, entire to slightly sinuate, 2–7 cm long, 1.5–3 mm broad. **Petiole** light brown, 1–5 mm long, 0.2–0.4 mm in diameter. **Lamina** linear, or slightly broadened distally, rigid, subcoriaceous, attenuate at base, the apex obtuse to subacute, rarely cuspidate, provided with a black or dark brown, lustrous, sclerenchymatous border 0.1–0.2 mm broad, essentially glabrous, but with scattered, caducous, minute, subclavate trichomes especially on costa and margin. **Veins** obscure, diverging from the

costa at a very acute angle, sterile ones simple, fertile ones furcate, hydathodes lacking. **Sori** roundish to elongate, confluent at maturity and sometimes slightly immersed in the tissue.

In open paramos or elfin forests, in sphagnum or on mossy hummocks, 2750–3500 m, San Martín, Huánuco, Cuzco.

Costa Rica; Colombia; Peru.

This is one of the three species from Peru in the genus with dark, sclerenchymatous borders (*Grammitis* s.s., fide Smith and Moran). In addition to the key characters, it differs also from *G. bryophila* and *G. limbata* in its smaller, more rigidly erect leaves and by the more acute vein angle. In *G. paramicola* veins diverge from the costa at about 10–15°, whereas the angle is commonly 30–50° in the other two species.

San Martín: Prov. Mariscal Cáceres, Chochos, NW corner of Río Abiseo National Park, *Young & León* 4760 (USM). **Huánuco:** Playapampa, *Macbride* 4520 (F, US). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley* 11061 (GH). Huadquiña, *Bües* 1271 (US).

4. *Grammitis pumila* (C. Chr.) Stolze, *comb. nov.*

Cochlidium pumilum C. Chr., Dansk. Bot. Ark. 6(3): 19, t. 3, f. 3. 1929. TYPE: Ecuador, Chuquiribamba, *Massee*, in 1868 (holotype, K).

Plants epiphytic or terrestrial. **Stem** erect or ascending, provided with bright orange, lanceolate, attenuate, nonclathrate scales, these 2–3 mm long. **Leaves** simple, entire to distally repand, 4–15 cm long, ca. 1 mm broad. **Petiole** brown to blackish, 2–5 mm long, 0.2–0.5 mm in diameter. **Lamina** linear, subcoriaceous, attenuate at base, fertile only in the distal portion, this often conduplicate, glabrous. **Veins** obscure, reduced to short spurs, hydathodes indistinct to obscure. **Sori** elongate, arranged in interrupted or continuous lines (coenosori).

In elfin forests or somewhat open places, on or at bases of trees, 2100–2600 m, Cajamarca and Huánuco.

Venezuela; Colombia to Bolivia; Brazil.

Cajamarca: Prov. Cutervo, La Pucarilla, Súcota to San Andrés, *López et al.* 6717 (F, GH). **Huánuco:** SW slope of Río Lullapichis watershed, ascent of Cerros del Sira, *Dudley* 13454A (GH), 13490 (GH).

5. *Grammitis myosuroides* (Sw.) Sw., J. Bot. (Schrader) 1800(2): 18. 1801. **Figure 5a.**

Polypodium myosuroides Sw., Prodr. 131. 1788. TYPE: Jamaica, *Swartz* (holotype, S; photo, US).

Xiphopteris myosuroides (Sw.) Kaulf., Enum. fil. 85. 1824.

Xiphopteris jamesonii Hooker, Sec. cent. ferns, t. 14. 1860. TYPE: Ecuador, Andes of Quito, *Jameson* (holotype, K).

Polypodium serrulatum var. *strictissimum* Hooker, Sp. fil. 4: 175. 1862, based on *Xiphopteris jamesonii* Hooker.

Polypodium jamesonii (Hooker) Jenman, Bull. Bot. Dept. 4: 112. 1897, *nom. illeg.*, not (Fée) Salomon, 1883.

Polypodium strictissimum (Hooker) Hieron., Bot. Jahrb. Syst. 34: 501. 1904.

Grammitis jamesonii (Hooker) Morton, Contr. U.S. Natl. Herb. 38: 96. 1967.

Lellingeria myosuroides (Sw.) Smith & Moran, Amer. Fern J. 81: 85. 1991.

Plants epiphytic. **Stem** small, erect, provided with grayish brown, clathrate, narrow-deltate, attenuate scales, these ca. 1 mm long. **Leaves** partly dimorphic, 3–10 cm long, 3–4 mm broad. **Petiole** dark brown to castaneous, 1–4 mm long, 0.2–0.4 mm in diameter. **Lamina** linear, chartaceous, attenuate at base, fertile only in the subentire distal portion, sterile portion deeply pinnatisect with 15–20 pairs of segments, these deltate and acute to oblong and obtuse, provided with scattered, minute, persistent, castaneous, setiform trichomes to 0.5 mm long. **Veins** simple and solitary in each sterile segment, black and extending at broad angles beyond the sporangia in the fertile portion, hydathodes indistinct or lacking. **Sporangia** borne at the base of veins, initially in discrete sori, but eventually confluent as 2 subcostal lines, merging into a broad, single, costal line at maturity.

Known thus far in Peru by a single collection from Cajamarca, edge of the road, 2700 m.

Mexico (Chiapas); Costa Rica; Jamaica; Cuba; Puerto Rico; Venezuela; Colombia to Peru.

Besides the key characters this differs also from *G. serrulata* in the blackish veins of the fertile portion of the lamina, which spread at a very broad angle from the costa and contrast strongly with the laminar tissue. Fertile veins of *G. serrulata* spread at an acute angle and contrast little with the laminar tissue. The sole collection of *G. myosuroides* in Peru was found growing together with specimens of the latter and *G. pumila*.

Cajamarca: Prov. Cutervo, La Pucarilla, between San Andrés and Socotá, *López et al.* 6716 (GH, HUT).

6. *Grammitis serrulata* (Sw.) Sw., J. Bot. (Schrader) 1800(2): 18. 1801.

Acrostichum serrulatum Sw., Prodr. 128. 1788. TYPE: Jamaica, Swartz (holotype, s; frag., us; isotypes, B, Herb. Willd. 19589-1 & -3; photos, GH of B).
Xiphopteris serrulata (Sw.) Kaulf., Wes. Farnkr. 87. 1827.
Polypodium serrulatum (Sw.) Mett., Fil. hort. bot. Lips. 30. 1856, not Sw. 1802.
Polypodium duale Maxon, Contr. U.S. Natl. Herb. 16: 61. 1912, *nom. nov.* for *Acrostichum serrulatum* Sw. and with the same type.
Cochlidium serrulatum (Sw.) Bishop, Amer. Fern J. 68: 80. 1978.

Plants epiphytic, occasionally epipetric. **Stem** ascending, provided with brown, narrow-deltate, nonclathrate scales, these 2–3 mm long. **Leaves** partly dimorphic, 3–8 cm long, to 2.5 mm broad. **Petiole** very short or obsolete. **Lamina** linear, firm-herbaceous, attenuate at base, fertile only in the subentire, sometimes conduplicate, distal portion, sterile leaf or portion serrate-dentate or with short, acute lobes, glabrous, or with some pale and caducous trichomes on juvenile plants. **Veins** indistinct to obscure, simple and solitary on each sterile segment, in fertile portion ascending at an acute angle and not contrasting strongly in color with the laminar tissue, hydathodes vestigial or lacking. **Sporangia** borne on costa and veins, becoming confluent in a single costal line (coenosorus).

In wet forests or clearings, on trees or fallen logs, 325–1800(–2700) m, Cajamarca, Loreto, and Huánuco south to Cuzco.

Southern Mexico to Panama; West Indies; Colombia to the Guianas, south to Bolivia and Brazil; wet tropical Africa.

This is one of the most widespread species of *Grammitis* in the Neotropics and one of the easiest to distinguish. For further comparisons, see discussion under *G. myosuroides*.

Cajamarca: Prov. Cutervo, La Pucarilla, between San Andrés and Socotá, López *et al.* 6715 (GH). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Schunke V. 7807 (MO). **Loreto:** Sierra del Pongo, Mexia 6287 (GH, MO, US). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Pampa Hermosa, Mexia 8258a (F, GH). **Pasco:** Prov. Oxapampa, west side of Cordillera de San Matías, between Iscozacín and summit, D. Smith 2041 (F, MO). **Junín:** East of Quimiri Bridge near La Merced, Killip & Smith 23886 (F, US). **Cuzco:** Valle de Cosñipata, between Yaramayo and Santa Isabel, Scolnik 863 (UC, US).

7. *Grammitis trifurcata* (L.) Copel., Gen. fil. 211. 1947.

Polypodium trifurcatum L., Sp. pl. 1084. 1753. TYPE: Plumier t. 138, Traité foug. Amér., illustrating a Plumier specimen from Martinique.
Glyphotaenium trifurcatum (L.) Lellinger, Amer. Fern J. 75: 31. 1985.
Enterosora trifurcata (L.) Bishop, Syst. Bot. 17: 353. 1992.

Plants epiphytic. **Stem** short-creeping to ascending, provided at the apex with dense clusters of closely imbricate, yellow or yellow-brown scales, these narrow-deltate, not or scarcely clathrate, 2–4 mm long, remotely ciliolate. **Leaves** monomorphic, 10–27 cm long, 2–3.5 cm broad. **Petiole** 3–8 cm long, commonly $\frac{1}{3}$ – $\frac{1}{2}$ the length of the lamina, lustrous, blackish or atropurpureous, amply to densely provided with spreading, castaneous, unicellular trichomes, these 1–1.5 mm long. **Lamina** subcarnose, lanceolate or elliptic-lanceolate, obtuse or subacute at apex, cuneate at base, cut $\frac{1}{3}$ – $\frac{1}{2}$ to the costa, the lobes obtuse (rarely subacute), the margins sparsely provided with trichomes like those of the petiole, or glabrate. **Veins** obscure, free or rarely anastomosing, pinnately branched in each lobe, hydathodes lacking. **Sori** round to elongate, borne at the tips of acroscopic vein branches, in 3–5 irregular series on each side of the costa, somewhat immersed in the tissue.

Uncommon, in dense forests, usually arched or pendent from tree trunks, 700–1900 m, Huánuco, Pasco, Madre de Dios.

West Indies; Costa Rica and Panama; the Guianas to Colombia; Ecuador to Bolivia.

Specimens of *G. trifurcata* from the West Indies, especially Jamaica, commonly bear two different kinds of indument: intermixed with the long, spreading, unicellular, trichomes can be found some scattered, minute, tortuous ones with 3–4 cells, the apical cell often glandular. No such trichomes have been observed in the few specimens found thus far in Peru. The character merits further examination in future monographic study.

Huánuco: SW slope of Río Llullapichis watershed, ascent of Cerros del Sira, Dudley 13084b (GH). **Pasco** (as Junín): Pichis Trail, Dos de Mayo, Killip & Smith 25803 (F, US). Pichis Trail, Porvenir, Killip & Smith 25894 (NY, US). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, Foster *et al.* 10847 (F, USM).

8. *Grammitis trichosora* (Hooker) Ching, Bull. Fan. Mem. Instit. Biol., Bot. 10: 241. 1941.

Polypodium trichosorum Hooker, Sec. cent. ferns, t. 12. 1860. TYPE: Ecuador, Archidona, Andes of Quito, *Jameson 349* (holotype, K!; photos, F, US). *Enterosora trichosora* (Hooker) Bishop, Syst. Bot. 17: 357. 1992.

Plants epiphytic. **Stem** short-creeping or repent, provided at the apex with dense clusters of closely imbricate, pale yellow scales, these narrow-deltate, nonclathrate, 1–2 mm long, entire to remotely denticulate or ciliolate. **Leaves** monomorphic, 8–18 cm long, 1–1.5 cm broad. **Petiole** 1–5 cm long, 0.4–0.8 mm in diameter, yellowish to reddish brown, densely covered with spreading, castaneous, unicellular trichomes 2 mm long. **Lamina** firm-herbaceous, elliptic to oblanceolate, apex subacute, base cuneate, margins subentire to remand or broadly and shallowly lobed, abundantly provided with persistent trichomes like those of the petiole. **Veins** obscure, pinnately branched, free to irregularly anastomosing especially away from the costa, hydathodes lacking. **Sori** round or slightly elongate, in 1–2 irregular series on each side of the costa, not or scarcely immersed in the tissue.

Thus far known in Peru by a single collection from San Martín, epiphyte in montane rain forest, 2100 m.

Ecuador and Peru.

Very similar is *Polypodium ecostatum* Sodiro (Central America; Antilles; northern South America). However, the latter is a much longer fern of lower elevations (under 1000 m), with sori rather deeply immersed in the subcarnose tissue. Also, the veins frequently anastomose along the costa, whereas areoles of *G. trichosora* are quite irregular, occurring infrequently along the costa, and are much more common about midway between costa and margin.

San Martín: Prov. Rioja, Venceremos, Pedro Ruíz-Moyobamba Road, *D. Smith & Vásquez 4727* (MO, USM).

9. *Grammitis parietina* (Klotzsch) Fée (Mém. foug. 5) Gen. fil. 233. 1852.

Polypodium parietinum Klotzsch, Linnaea 20: 373. 1847. TYPE: Venezuela (as "Columbia"), Colonia Tovar, *Moritz 253* (holotype, B!; isotype, BM; photo, F of B).

Polypodium sprucei Hooker, Sec. cent. ferns, t. 10. 1860. TYPE: Peru, San Martín, Tarapoto, *Spruce 4746* (holotype, K!; isotype, US!).

Grammitis sprucei (Hooker) John Sm., Hist. fil. 181. 1875.

Enterosora parietina (Klotzsch) Bishop, Syst. Bot. 17: 357. 1992.

Plants epiphytic. **Stem** small, ascending, provided at apex with a few inconspicuous, deep orange scales, these entire or ciliolate, obscurely clathrate, 0.5–1 mm long. **Leaves** monomorphic, 4–9 cm long, 0.4–0.8 cm broad. **Petiole** to 0.7 cm long or obsolete, 0.4–0.6 mm in diameter, brown to blackish, amply provided with spreading, castaneous, unicellular trichomes about 1 mm long. **Lamina** subcarnose to chartaceous, oblong-elliptic, apex obtuse or subacute, base attenuate, margins subentire to sinuate or crenate, amply provided with trichomes like those of the petiole. **Veins** obscure, free, commonly 1-forked, hydathodes lacking. **Sori** roundish, in a single series on each side of the costa, superficial or slightly immersed in the tissue.

In cloud forests, on tree trunks, 1900–2400 m, Amazonas, Pasco, San Martín and Cuzco.

Southern Mexico; Guatemala; Costa Rica and Panama; Jamaica; Hispaniola; Venezuela; Colombia to Peru.

The species thus far is represented in Peru by only three widely scattered collections. Because of its small size and inconspicuous leaves it has likely been overlooked, and a more diligent search should reveal it to be in intervening localities.

Amazonas: Prov. Bagua, 12–20 km E of La Peca, *Barbour 2723* (F). **Pasco:** Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al. 8496* (MO). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley 11302* (GH).

10. *Grammitis phalacron* Stolze, sp. nov.

Caulis breve gracilisque, paleis 1–1.5 mm longis, castaneis, setosis, angusti-deltatis, non clathratis. Folia 7–12 cm longa, 0.6–0.8 cm lata. Petiolus 1–2 cm longus, trichomatibus circa 2 mm longis, aurantiacis, unicellularibus. Lamina anguste elliptica, subintegra vel repanda, glabrata vel trichomatibus 0.2–0.4 cm longis, pallescentibus, tortuosis, pluricellularibus. Hydathodi nulli. Sori rotundi, discreti, praphysibus glandulis.

Plants probably epiphytic. **Stem** short, slender, provided with castaneous, narrow-deltate, setose, nonclathrate scales, these 1–1.5 mm long. **Leaves** monomorphic, 7–12 cm long, 0.6–0.8 cm broad. **Petiole** 1–2 cm long, 0.2–0.4 mm in diameter, dark brown to blackish, amply provided with spreading, orange, unicellular trichomes, these to 2 mm

long. **Lamina** firm-herbaceous to chartaceous, narrow-elliptic, apex obtuse to subacute, cuneate at base, margins subentire or repand to very broadly and shallowly lobed, abaxially provided with scattered, pale, tortuous, pluricellular trichomes, these 0.2–0.4 mm long, caducous. **Veins** indistinct, 1–2-forked to pinnate, hydathodes lacking. **Sori** round, borne on basal vein branches and forming a single series on each side of the costa, paraphyses glandular.

TYPE—Peru, Cuzco, Valley of Río Urubamba, *Bües A29* (holotype, US!).

Known only from the type.

In general aspect, this appears to be intermediate between *G. parietina* and *Polypodium* (*Grammitis*) *ecostatum* Sodiro (Ecuador). However, the completely different indument, the glandular paraphyses and the thinner textured lamina (vs. laminae with spongy parenchyma) argue against such affinity. The specimen was annotated by Bishop and Smith as *Ceradenia phalacron*, with intent to publish at a later date. Their kind permission for publication as *Grammitis* in this flora is greatly appreciated.

11. *Grammitis longipinnata* (Copel.) Lell., Amer. Fern J. 74: 58. 1984.

Ctenopteris longipinnata Copel., Philipp. J. Sci. 84: 459. 1956. **TYPE**: Peru, Cuzco, Cabecera del Koribeni, *Bües 1952* (holotype, US!).

Ceradenia longipinnata (Copel.) Bishop, Amer. Fern J. 78: 5. 1988.

Plants probably epiphytic. **Stem** unknown. **Leaves** to 30 cm long and 10 cm broad. **Petiole** 8–10 cm long, 1 mm in diameter, blackish, sublustrous, glabrescent. **Lamina** chartaceous to subcoriaceous, subdeltate, not or scarcely reduced at base, deeply pinnatisect to fully 1-pinnate toward the base, rachis amply provided with spreading, castaneous trichomes to 1 mm long; **pinnae** falcate and somewhat ascending, linear-deltate, acute to attenuate, margins with scattered, castaneous trichomes and deeply serrate, but distal ones merely crenulate or entire. **Veins** obscure, free, 1-forked, hydathodes lacking. **Sori** round to slightly elongate, in a single supramedial to submarginal series on each side of the costa.

Endemic. Thus far known from the type and two other collections from Cuzco, 2750–3250 m.

The Dudley specimen was pendulous from trees in a dark, wet, cloud forest.

Nothing is known of the stem characteristics of this species, since leaves of the only known specimens are broken off at the petiole base. No habit was mentioned on labels of the type and the other *Bües* collection.

Cuzco: Valle de Lares, *Bües 1793* (us). Prov. La Convención, 25 km from Hacienda Luisiana and the Apurímac River, *Dudley 11106* (us).

12. *Grammitis meridensis* (Klotzsch) Seymour, Phytologia 31: 179. 1975.

Polypodium meridense Klotzsch, Linnaea 20: 380. 1847. **TYPE**: Venezuela, Edo. Mérida, Mérida, *Moritz 335* (holotype, B!; photo, F).

Ctenopteris meridensis (Klotzsch) Copel., Philipp. J. Sci. 84: 464. 1956.

Ceradenia meridensis (Klotzsch) Bishop, Amer. Fern J. 78: 5. 1988.

Plants terrestrial, at least in Peru. **Stem** short-creeping to ascending, abundantly provided with linear, rigid, lustrous, deep orange to castaneous scales, these (2–)3–6 mm long, nonclathrate, amply setulose, the setae whitish. **Leaves** monomorphic, articulate and approximate on the stem, 20–40(–50) cm long, 3–7 cm broad. **Petiole** 8–30 cm long (usually as long as the lamina), 0.4–1 mm in diameter, lustrous, castaneous to atropurpureous or blackish, sparsely to amply pilose, or glabrescent at maturity, the trichomes castaneous, spreading, unicellular, 0.4–1 mm long. **Lamina** firm-herbaceous to chartaceous, oblong or oblong-deltate, truncate at base, deeply pinnatisect, or rarely 1-pinnate at base, rachis moderately provided on both sides with spreading, castaneous, trichomes to 1 mm long. **Segments** patent or slightly ascending, linear-deltate, acute or subacute, trichomes like those of the rachis, sparse along the margins and sometimes on the abaxial surface, especially among the sori. **Veins** completely obscure, commonly once-forked, hydathodes lacking. **Sori** superficial, round, supramedial to submarginal, immature sporangia intermixed with pale, waxy paraphyses.

In dense, wet forests or wooded ravines, on clay banks or in humus, 1500–3600 m. Huánuco to Cuzco.

Costa Rica; Panama; Venezuela and Colombia south to Brazil and Bolivia.

This species is especially distinguished by the

long (to 1 mm), spreading, dark, unicellular trichomes on both sides of the rachis and by the truncate lamina base with basal pinnae longer or nearly as long as medial ones. Very similar, and probably conspecific, are *Polypodium spixianum* Mett. of Brazil and *P. abitaguae* Hooker of Ecuador. Both apparently differ from *G. meridensis* in the lighter orange color and greater length (to 9 mm) of stem scales, and sori of *P. abitaguae* are medial rather than supramedial or submarginal. Some specimens have been determined as *P. spixianum* on the basis of slightly thinner lamina texture and nearly obtuse segment apices, but both characters are too variable to be significant. This condition seems to pertain to juvenile and/or depauperate plants, while thicker texture and longer, acute segments are common to fully mature leaves.

Huánuco: Cani, pueblo 7 mi NE of Mito, *Macbride 3491* (F, US). Vilcabamba, *Macbride 5145* (F in part, US). **Pasco:** Pichis Trail, Porvenir (as Junín), *Killip & Smith 25939* (F, NY, US). Prov. Oxapampa, Dist. Chontabamba, near the summit of San Gutardo, *León et al. 524* (USM, juvenile specimens), 526 (F, USM). **Junín:** Chanchamayo Valley, *C. Schunke 853* (F), 1380 (F). **Cuzco:** Prov. La Convención, Valle San Miguel, *Bües 2133* (US). Prov. Paucartambo, near El Mirador, Manú National Park, *León 2265* (F, USM). Prov. Paucartambo, Cordillera de Tres Cruces, *Vargas 12191* (GH).

13. *Grammitis bishopii* Stolze, *sp. nov.*

Plantae terrestres. Caulis repens, 1.5–3 mm crassus, paleis abundantibus, linearibus, rigentibus, nitentibus, castaneis, 2–4 mm longis, 0.2–0.4 mm latis, setulosis, setulis concoloribus. Folia 18–34 cm longa, 4–10 cm lata, subdistantia, ad phyllopodia bulbosa affixa. Petiolus 10–24 cm longus, nitidus, castaneus vel atropurpureus, glaber. Lamina 1-pinnata, deltata, basi non reducta. Rhachis et costa trichomatibus minutis, castaneis, unicellularibus, abundantibus praeditae. Venae obscurae, 1–2-furcatae, raro anastomosantes. Hydathodi nulli.

Plants terrestrial. **Stem** long-creeping, 1.5–3 mm in diameter, densely clothed with linear, rigid, lustrous, castaneous scales, these 2–4 mm long, 0.2–0.4 mm broad, nonclathrate, sparingly to amply setulose, the setae concolorous with the scale body. **Leaves** monomorphic, borne on short (1–2 mm), often bulbous phyllopodia, usually 1–2 cm apart, 18–34 cm long, 4–10 cm broad. **Petiole** 10–24 cm long, 1–2 mm in diameter, lustrous, castaneous to atropurpureous, essentially glabrous. **Lamina** subcoriaceous, narrowly or broadly deltate, not or scarcely reduced at base, 1-pinnate, the segments adnate, slightly ascending to slightly reflexed, lin-

ear, acute, their margins often with minute, scattered, glandular trichomes, the rachis adaxially with dense, minute, castaneous, rigid, unicellular trichomes, these 0.1–0.3 mm long, costae with similar, but shorter and fewer, trichomes. **Veins** completely obscured (even when held to light), 1–2-forked, often connivent distally, on some specimens frequently anastomosing, hydathodes lacking. **Sori** superficial, commonly round, essentially medial between (and at maturity often crowding both) costa and margin, paraphyses not seen.

TYPE—Peru, Pasco, Prov. Oxapampa, border Prov. Oxapampa and Pasco, *van der Werff et al. 8569* (holotype, UC!; isotype, MO!).

In elfin or cloud forests, in clay or sphagnum, 2700–3000 m, Amazonas, Pasco and Cuzco.

Peru; Bolivia (*Tate 349* [NY]).

This may be confused with *G. werffii*. In addition to the characters used in the key, this differs in the rarely (vs. frequently in the latter) anastomosing veins and in the short, rather swollen, phyllopodium that joins the petiole base to the stem. In *G. werffii* the petiole base is articulate and the line of abscission very evident.

The species is named in honor of the late L. Earl Bishop, who recognized this as a new species and tentatively labeled several of the specimens as “*Ceradenia vaga*,” but until now it has remained undescribed.

Amazonas: Prov. Bagua, Cordillera Colán, E of La Peca, *Barbour 3264* (MO, USM). **Pasco:** Prov. Oxapampa, Dist. Chontabamba, near the summit of San Gutardo, *León et al. 526* (USM). Prov. Oxapampa, Cerro Pajonal, 29 km from Oxapampa, *D. Smith & Foster 2504* (UC). Border, Prov. Oxapampa and Pasco, below San Gutardo (as “Cotardo”), *van der Werff et al. 8550* (MO). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley 10892* (F, GH), 11145 (GH, US).

14. *Grammitis discolor* (Hooker) Morton, Amer. Fern J. 60: 66. 1970.

Polypodium discolor Hooker, Icon. pl. 4: t. 386. 1841. **TYPE:** “British Guiana” (Guyana), *Schomburgk 1031* (holotype, K; photo, F).

Ctenopteris discolor (Hooker) John Sm., Hist. fil. 185. 1875.

Ceradenia discolor (Hooker) Bishop, Amer. Fern J. 78: 4. 1988.

Plants probably terrestrial. **Stem** stout, erect, provided with linear, brown scales, these 3–6 mm long, nonclathrate, entire to sparsely and remotely setulose. **Leaves** not articulate, 9–20 cm long, 1–2 cm broad. **Petiole** essentially obsolete. **Lamina**

subcarnose, linear to narrow-elliptic, strongly and gradually reduced at base, deeply pinnatisect (about $\frac{3}{4}$ to the rachis) the segments 1–2 times as long as broad, rachis rarely evident (usually immersed in the tissue), rachis and tissue lacking trichomes, moderately to densely farinose, the farina white, mostly disposed in stellate patterns. **Veins** obscure, free, pinnately branched in the segments, hydathodes lacking. **Sori** round, submarginal, with farina deposited among the sporangia.

In dense forests, apparently terrestrial (habit not cited on any of the labels seen, but clay particles evident among the roots), 1300–2000 m, thus far found only in Junín.

Guyana; Venezuela; Colombia; Peru; Bolivia.

This is very similar to *G. curvata* ssp. *pearcei*, differing only in the farina pattern and the shape of segments and may represent merely another infraspecific variant of the latter.

Junín: Schunke Hacienda above San Ramón, *C. Schunke* A152 (GH, US). Chanchamayo Valley, *C. Schunke* 470 (F, US), 513 (F, US).

15. *Grammitis curvata* (Sw.) Ching, ssp. *pearcei* (Baker) Stolze, stat. & comb. nov.

Polypodium pearcei Baker, in Hooker and Baker, Syn. fil., ed. 2: 508. 1874. LECTOTYPE (designated here): Ecuador, Cuesta de Puente Grande, *Pearce* in June 1865 (K!, photo, F; isoelectotype, 2 laminae on the right, K!).

Ctenopteris amyloacea Copel., Philipp. J. Sci. 84: 469. 1956. TYPE: Bolivia, Cargadira, *R. S. Williams* 1134 (holotype, US!; isotypes, GH!, UC!).

Grammitis amyloacea (Copel.) Morton, Contr. U.S. Natl. Herb. 38: 233. 1973.

Ceradenia pearcei (Baker) Bishop, Amer. Fern J. 78: 4. 1988.

Plants epiphytic or epipetric. **Stem** stout, erect, provided with linear, orange-brown to ferruginous scales, these 3–6 mm long, nonclathrate, sparsely to amply setose, the setae pale orange or whitish. **Leaves** not articulate, 12–30(–35) cm long, (2.5–) 3–8 cm broad. **Petiole** essentially obsolete. **Lamina** subcarnose, rachis and costae rarely evident (usually immersed in the tissue), narrowly to broadly elliptic, strongly and gradually reduced at base, deeply pinnatisect, the segments 3–7 times as long as broad, rachis and tissue lacking trichomes, moderately farinose, the farina particles white (often brown on dried specimens), solitary or disposed in small, amorphous clusters. **Veins** obscure, free, once-forked from the costa, hydathodes lacking. **Sori** round, borne at the tip of the acros-

copic vein branch, submarginal, at maturity extending beyond the segment margin, with farina deposited among the sporangia.

In scrub and cloud forests, on tree trunks or in crevices of rocky cliffs, 2000–2750 m, Amazonas, Huánuco, Cuzco.

Peru; Bolivia.

This differs from ssp. *curvata* (West Indies) in the longer and more abundant setae on the stem scales. Furthermore, ssp. *curvata* has minute, appressed (sometimes glandular?) trichomes scattered on the lamina, in addition to the farina deposits. These trichomes are 0.1–0.2 mm long, cylindrical, castaneous, and are often quite abundant, though very inconspicuous. Such processes have not been seen in specimens of ssp. *pearcei*. Also very similar (and likely another subspecies) is *Grammitis albidula* (Baker) Morton, from southeastern Brazil, but the latter has smaller leaves and supramedial (vs. submarginal) sori.

There are two sheets of *Pearce* specimens in the type folder at Kew. One has the stem and several leaves and bears a printed label marked “Type Specimen.” The other sheet has two laminae without a stem, and a third lamina from another *Pearce* collection with the number 279 and “holotype” handwritten in blue ink. The two stemless laminae were annotated by Bishop (1988) as lectotype, but that typification has not been published. The other sheet is a much preferable lectotype, since the plant is complete and not mixed, and is so designated here.

Amazonas: Prov. Bagua, E of La Peca, *Barbour* 2767 (F, UC). Prov. Chachapoyas, west of Molinopampa, *Wurdack* 1499 (us), 1543 (us). **Huánuco:** Cushi, trail to Tambo de Vaca, *Bryan* 686 (F, US). **Cuzco:** Prov. Paucartambo, Manú Park, between Pillahuata and Pilcopata, *Skog & Skog* 5198 (us).

16. *Grammitis terrestris* (Bishop) Stolze, comb. nov.

Ceradenia terrestris Bishop, Amer. Fern J. 79: 23. 1989. TYPE: Peru, Amazonas, Prov. Chachapoyas, south of Molinopampa–Diosan Pass, *Wurdack* 1643 (holotype, us!; isotype, GH!).

Plants terrestrial. **Stem** stout, erect, provided with linear-deltate, deep orange to castaneous, nonclathrate scales, these 3–5 mm long, moderately to amply setulose. **Leaves** not or scarcely articulate, 8–18 cm long, 1–2 cm broad, lacking long, spreading unicellular trichomes. **Petiole** 1–2 cm long, 0.6–0.9 mm in diameter, minutely glan-

dulose, often white-farinose. **Lamina** subcarnose, linear-elliptic, gradually reduced at base and apex, copiously white-farinose and with some minute, glandular trichomes (especially on segment margins), pinnatisect, the segments closely spaced, joined by a narrow wing of tissue and ascending at a 30–50° angle, sclerenchyma of the rachis abaxially exposed, or sometimes concealed by laminar tissue. **Veins** obscure, free, usually once-forked, hydathodes lacking. **Sori** roundish, essentially medial, at maturity often extending from costa to margin, with farina deposited among the sporangia.

Thus far known only from the type collection, on moist bank in scrub forest, 2700–3100 m, Amazonas.

In Peru, this is most closely related to *G. herrerae*. In addition to the key characters, it differs also by the narrower, more rigid lamina and by the petiole not or scarcely articulate to the stem. While the base of the petiole in *G. herrerae* is not swollen or noticeably discolored, in age it does fracture clearly at the base, leaving a clear and somewhat concave scar at the stem.

17. ***Grammitis herrerae*** (Copel.) Morton, Contr. U.S. Natl. Herb. 38: 233. 1973. *Ctenopteris herrerae* Copel., Philipp. J. Sci. 84: 467. 1956. LECTOTYPE (designated by Morton, 1973): Peru, Cuzco, Huadquiña, Bües 1269 (us!).

Ceradenia herrerae (Copel.) Bishop, Amer. Fern J. 78: 4. 1988.

Plants possibly epiphytic. **Stem** small, erect, sparsely provided with narrow-deltate, orange-brown, nonclathrate, subentire scales ca. 1 mm long. **Leaves** cleanly but inconspicuously articulate at the stem, 10–30 cm long, 1.7–4 cm broad, lacking long, spreading, unicellular trichomes. **Petiole** (1–)2.5–7 cm long, 0.5–0.7 mm in diameter, densely glandulose. **Lamina** subcarnose, elliptic, gradually reduced at apex and base, white-farinose and with some minute, glandular trichomes, pinnatisect, the segments closely spaced, joined by a narrow wing of tissue and ascending at a 60–80° angle, sclerenchyma of the rachis mostly exposed. **Veins** obscure, free, simple to once-forked, hydathodes lacking. **Sori** round, supramedial, at maturity rarely extending beyond the segment margin, with farina deposited among the sporangia.

In forests, 2750–3000 m, Cuzco. No habit was

recorded on labels of specimens seen, but the one specimen with a stem (Bües 1268) has only adherent organic matter, so the species is apparently epiphytic.

Endemic.

The species most closely related to this is *G. terrestris*, under which see further comparison.

Cuzco: Huadquiña, Bües 1268 (paratype, us). Prov. La Convención, Abra Mirador, Bües 2073 (us).

18. ***Grammitis dendrodoxa*** (Bishop) Stolze, *comb. nov.*

Ceradenia dendrodoxa Bishop, Amer. Fern J. 79: 15. 1989. TYPE: Peru, Amazonas, Prov. Chachapoyas, Cerros de Calla Calla, Wurdack 1715 (holotype, ucl; isotypes, F!, GH!, NY!, US!).

Plants epiphytic (in Peru) or epipetric. **Stem** erect, provided with linear or narrow-deltate, lustrous, castaneous, nonclathrate scales, these 1–3 mm long, the margins remotely white-setulose. **Leaves** 1-pinnate, cleanly but inconspicuously articulate at the stem, pendent, 12–75 cm long, 4–8 cm broad, lacking long, spreading, unicellular trichomes. **Petiole** 2–6 cm long, 0.3–0.6 mm in diameter, glandulose. **Lamina** firm-herbaceous to chartaceous, elliptic, abruptly reduced at apex, less abruptly so at base, several proximal segments much shorter than the medial ones, glandulose and with some pale farina scattered on both sides, rachis castaneous to atropurpureous, glandulose, nonalate. **Pinnæ** to 10 cm long, ca. 1.5 mm broad, subdistant to remote, ascending at a 20–35° angle, linear, attenuate to apex and base. **Veins** obscure, free, simple, hydathodes lacking. **Sori** round, at maturity extending well beyond the pinna margins.

In forests or wooded ravines, on tree trunks or branches, 3400–3950 m, Amazonas and Huánuco. Ecuador; Peru.

Of the *Grammitis* species lacking hydathodes and long, dark, spreading trichomes, this is the most easily identified. It can be clearly distinguished by strongly ascending, nearly filiform pinnæ whose mature sori extend so far beyond the margins that the pinnæ at first appear to be lobed or dentate.

Huánuco: Tambo de Vaca, Bryan 626 (F, us).

19. ***Grammitis farinosa*** (Hooker) Morton, Contr. U.S. Natl. Herb. 38: 99. 1967.

Polypodium farinosum Hooker, Icon. pl. 10: t. 947. 1854; Cent. ferns t. 47. 1854. TYPE: Ecuador, Cordillera of Quito, Jameson (holotype, k; frag., us!).

Ctenopteris farinosa (Hooker) Copel., Philipp. J. Sci. 84: 470. 1956.

Ceradenia farinosa (Hooker) Bishop, Amer. Fern J. 78: 4. 1988.

Plants terrestrial or epiphytic. **Stem** erect, provided with elliptic-lanceolate, orange to castaneous, nonclathrate scales, these 1–2.5 mm long, minutely glandular-ciliolate. **Leaves** 1-pinnate, clearly but inconspicuously articulate at the stem, 12–40 cm long, 1.8–5 cm broad, lacking long, spreading, unicellular trichomes. **Petiole** 5–10 cm long, 0.5–0.9 mm in diameter, densely glandulose. **Lamina** chartaceous, elliptic-lanceolate or narrowly oblanceolate, abruptly reduced at apex and base, at least several pairs of proximal segments less than half as long as medial ones, densely white-farinose, the farina turning brown at maturity, rachis dark brown, glandulose, nonalate. **Pinnae** 1–3.5 cm long, 2.5–5 mm broad, approximate to subdistant on the rachis, ascending at a 60–80° angle, linear-deltate, obtuse to acute, base rounded to truncate acroscopically, decurrent basiscopically. **Veins** obscure, free, commonly once-forked, hydathodes lacking. **Sori** round, supramedial, not or rarely extending beyond pinna margins.

In forests or clearings, terrestrial or on tree trunks, thus far known by one collection from Peru, ca. 2800 m, Huánuco.

Colombia; Ecuador; Peru.

In the only collection found thus far in Peru, the lamina is not densely white-farinose as in some other specimens seen from Ecuador. In this species the farina apparently often turns brownish or falls away as the leaf reaches maturity.

Huánuco: Cushi, trail to Tambo de Vaca, Bryan 569B (f, us).

20. *Grammitis congesta* (Copel.) Lell., Amer. Fern J. 74: 58. 1984.

Ctenopteris congesta Copel., Philipp. J. Sci. 84: 397. 1956. TYPE: Peru, Cuzco, Prov. La Convención, Loma Grande, Bües 2172 (holotype, us!).

Habit and stem unknown. **Leaves** 10–15 cm long, 0.6–1 cm broad. **Petiole** 2–4 cm long, 0.2–0.5 mm in diameter, sparsely and deciduously pilose with castaneous trichomes. **Lamina** coriaceous, linear,

1-pinnate, rachis and pinnae abundantly provided with spreading, castaneous, unicellular trichomes to 2 mm long, rachis dark brown or blackish. **Pinnae** crowded, slightly ascending, to 5 mm long and 2.5 mm broad, circular, obovate or broadly oblong, the apex obtuse. **Veins** obscure, free, simple, hydathodes lacking or very indistinct. **Sori** round, 2–5 on a pinna, discrete, or confluent at maturity.

Thus far known only from the type, 4000–4300 m, Cuzco.

In general aspect, this resembles *G. moniliformis*, but it is distinguished from the latter by its lack of (or very indistinct) hydathodes, and by the abundant, spreading unicellular trichomes on the rachis and pinnae. In *G. moniliformis* hydathodes are present (although sometimes conspicuous); furthermore, the long, unicellular trichomes are very sparsely scattered on the lamina and the rachis is beset with numerous, minute, pluricellular, glandular trichomes.

The leaves on the type specimen lack stems, and there is no habit or habitat data on the label, so these vital characters are still open to speculation.

21. *Grammitis praeclara* (Bishop) Stolze, *comb. nov.*

Ceradenia praeclara Bishop, Amer. Fern J. 79: 16. 1989. TYPE: Peru, Cuzco, Prov. La Convención, Valle de San Miguel, Bües 2179 (holotype, us!).

Plants probably epiphytic. **Stem** small, provided with narrow-deltate, lustrous, deep orange to castaneous, nonclathrate scales, these 1–2 mm long, with a few marginal glands and short setae. **Leaves** lax (pendent?), 1-pinnate, not or scarcely articulate, 15–30 cm long, 2.5–5 cm broad. **Petiole** brown to blackish, 1–3 cm long, 0.2–0.3 mm in diameter, amply provided with spreading, orange, unicellular trichomes ca. 1.5 mm long, and rather abundantly with minute glandular trichomes and sessile glands. **Lamina** firm-herbaceous to chartaceous, narrow-elliptic, rather abruptly narrowed at apex and base, indument as on the petiole but the long, spreading trichomes rather sparse, rachis and costae blackish. **Pinnae** well spaced, ascending at a 50–70° angle, 1.5–3.5 cm long, 2–3.5 mm broad, narrow-deltate, subacute at apex, the base rounded nearly to costa acroscopically, short-decurrent basiscopically. **Veins** obscure, free, simple, or occasionally once-forked, hydathodes lacking. **Sori** round, medial or inframedial, the sporangia naked.

Known only from the type, 3150 m, Cuzco.

The type label cites no habit or habitat data, but organic material clings to the stem and the leaves are rather lax, which implies a pendent habit, so the plant was probably epiphytic.

22. **Grammitis capillaris** (Desv.) Proctor, Brit. Fern Gaz. 9: 218. 1965.

Polypodium capillare Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck., Gesammten Naturk. 5: 316: 1811. TYPE: Jamaica, *Tussac?* (holotype, ♀, *Herb. Desvaux*; photo, US).

Ctenopteris capillaris (Desv.) Copel., Philipp. J. Sci. 84: 402. 1956.

Ceradenia capillaris (Desv.) Bishop, Amer. Fern J. 78: 4. 1988.

Plants apparently epiphytic. **Stem** erect or ascending, provided with narrow-deltate, lustrous, deep orange to castaneous, nonclathrate scales, these 1–2 mm long, with a few marginal glands and short setae. **Leaves** 1-pinnate (at least proximally), not or scarcely articulate, 6–15(–18) cm long, 1.5–4 cm broad. **Petiole** 1–2.5 cm long, 0.2–0.4(–0.5) mm in diameter, sparsely glandular and moderately to densely provided with spreading, deep orange, unicellular trichomes ca. 1 mm long. **Lamina** thin- to firm-herbaceous, narrowly or broadly elliptic, rather abruptly reduced at apex and base, indument as on the petiole, but the spreading trichomes sparse to lacking, rachis and (sometimes) costae dark brown to blackish and usually lustrous, especially abaxially. **Pinnae** well spaced, ascending at a 25–40° angle, 0.8–2.5 cm long, 0.8–2 mm broad, linear to narrow-deltate, acute or subacute at apex, the base fully adnate and nearly perpendicular to the rachis acroscopically, long-decurrent basiscopically. **Veins** free, indistinct or obscure, simple, hydathodes lacking. **Sori** round, supramedial, most of them extending beyond the pinna margin at maturity.

In forests, probably on tree trunks (although habit is not cited on any of the specimen labels from Peru), 1600–2750 m, Huánuco to Cuzco.

West Indies; Venezuela; Colombia to Peru; Bolivia; southern Brazil.

Copeland did not see the type of *Polypodium capillare*, and his concept of the species (Copeland, 1956, p. 402) was actually that of *P. pilipes*, under which see further discussion.

Huánuco: Pampayacu, *Kanehira* 185 (GH, US). **Playa-pampa,** *Macbride* 4522 (F, US). **Pasco:** Oxapampa, *Soukup* 2356 (US). **Junín:** Schunke Hacienda, above San Ra-

món, *C. Schunke* A153 (US). Chanchamayo Valley, *C. Schunke* 469 (F). **Cuzco:** Prov. La Convención, Valle de Santa Ana, *Herrera* 3011 (US). **Department unknown:** "Perou," *Lechler* 153 (F), *Mathews* 921 (NY).

23. **Grammitis pilipes** (Hooker) Morton, Phytologia 22: 77. 1971.

Polypodium pilipes Hooker, Icon. pl. 3: t. 221. 1840.

TYPE: Peru (Amazonas), Chachapoyas, *Mathews* in 1838 (holotype, 2 sheets, κ; probable isotype, F!; photo, US of κ).

Polypodium pozuzoense Baker, Icon. pl. 17: t. 1672.

1886. TYPE: Peru (Pasco), Pozuzo, *Pearce* in 1863 (holotype, 2 sheets, κ; photo, US).

Ceradenia pilipes (Hooker) Bishop, Amer. Fern J. 78: 4. 1988.

Plants epiphytic. **Stem** erect or ascending, provided with narrow-deltate, lustrous, deep orange to castaneous, nonclathrate scales, these 1–2 mm long, with a few marginal glands and short setae. **Leaves** 1-pinnate (at least proximally), not or scarcely articulate, (12–)17–45 cm long, 3–7(–10) cm broad. **Petiole** 1–4 cm long, (0.4–)0.6–0.9 mm in diameter, sparsely to abundantly glandular and amply to densely provided with spreading, deep orange, unicellular trichomes ca. 2 mm long. **Lamina** subcarnose, narrowly or broadly elliptic, rather abruptly reduced at apex and base, indument as on the petiole, but the spreading trichomes sparse to lacking, sclerenchyma of the rachis usually obscured by the laminar tissue or, if rarely evident, then not lustrous. **Pinnae** well spaced, ascending at a 25–40° angle, (2–)3–4(–12) cm long, 1.5–2 mm broad, linear, acute to attenuate at apex, the base fully adnate and nearly perpendicular to the rachis acroscopically, long-decurrent basiscopically, proximal pinnae rarely bearing a few irregular short and narrow segments. **Veins** free, obscure, simple, hydathodes lacking. **Sori** round, most of them extending beyond the pinna margin at maturity.

In elfin or cloud forests or thickets, on tree trunks or branches, 1900–3700 m, Amazonas, San Martín, Pasco, and Cuzco.

Costa Rica; Venezuela; Colombia to Peru.

In addition to the key characters, this species can also be distinguished from *G. capillaris* by the usually longer leaves and petiole trichomes. Furthermore, there is a strong tendency for the lamina of *G. pilipes* to have greatly elongate pinnae (to 12 cm!) scattered irregularly among the normal ones. Also, very rarely a few proximal pinnae may be partially pinnatifid, with a few short, irregular segments. These were the characters on which *Poly-*

podium pozuzoense was based. Such leaves seem to be monstrous forms, but those with elongate pinnae are not uncommon. Neither do these specimens appear to be hybrids, for no abortive spores or sporangia have been detected.

Despite all these differences, *G. capillaris* and *G. pilipes* are very closely related and there are frequent intermediates, which can only be identified by using the larger combination of a suite of characters.

Amazonas: Prov. Bagua, Cordillera Colán east of La Peca, *Barbour 3263* (MO, USM). **San Martín:** Moyobamba, *Mathews* (K). **Pasco:** Prov. Oxapampa, Parque Nacional Yanachaga, *Foster & d'Achille 12256* (F). **Cuzco:** Prov. La Convención, Hacienda Pintobamba above Huailayoc, *Bües 1956* (GH, US). Prov. La Convención, Cordillera Vilcabamba, *Dudley 10893* (GH), *10996* (GH, MO). Prov. Paucartambo, Pillahuata, Puente de Aguila, *Vargas 16746* (GH).

24. *Grammitis mirabilis* (Bishop) Stolze, *comb. nov.*

Ceradenia mirabilis Bishop, Amer. Fern J. 79: 22. 1989. TYPE: Bolivia, Cochabamba, Carmen, *Brooke 6134*, corrected from *6134a* (holotype, BM!; isotypes, NY, U, US).

Plants epiphytic or terrestrial. **Stem** short-creeping, provided with narrow-deltate, clathrate scales, these 1–3 mm long, gray-brown, iridescent, the margins entire, or with glands near the tips. **Leaves** lax, not or scarcely articulate to the stem, approximate or crowded, 2-pinnate, 12–30 cm long, 3–8 cm broad. **Petiole** 4–8 cm long, 0.5–0.8 mm in diameter, sparsely puberulent with simple or branched, septate trichomes 0.1–0.3 mm long, or glabrescent. **Lamina** chartaceous, indeterminate, abruptly reduced at base, elliptic, with 10–15 pairs of strongly ascending pinnae. **Rachis** flexuous, moderately puberulent as on the petiole. **Pinnae** sessile, 3–8 cm long, linear, 1-pinnate, costa puberulent, the pinnules adnate, 2–3 mm long, spatulate. **Veins** obscure, simple or 1-forked in the pinnules, hydathodes lacking or very indistinct. **Sori** round, one to a pinnule, sporangia glabrous.

Thus far known in Peru from a single collection, growing between boulders in woods, 4090 m, Ancash.

Peru and Bolivia.

Ancash: Prov. Huaráz, Huascarán National Park, Quebrada Llaca, *D. Smith & Buddensiek 11142* (MO).

25. *Grammitis mathewsii* (Mett.) Morton, Amer. Fern J. 60: 66. 1970.

Polypodium mathewsii Mett., Abh. Senckenberg Naturf. Ges. 2: 74 (über farngat. I. *Polypodium*). 1856. LECTOTYPE (designated by Bishop, Amer. Fern J. 79: 108. 1989): Peru, *Mathews 1811* (B!, photo, F; isolectotype, B!, BM! K, P).

Zygophlebia mathewsii (Mett.) Bishop, Amer. Fern J. 79: 108. 1989.

Plants epiphytic, rarely epipetric or terrestrial. **Stem** stout, suberect, provided with dense clusters of linear, rigid, lustrous, deep reddish brown scales, these 4–6 mm long, 0.2–0.4 mm broad, nonclathrate, entire. **Leaves** monomorphic, 25–60 cm long, 5–12 cm broad. **Petiole** 10–28 cm long, 0.7–2 mm in diameter, dull yellowish or grayish brown, amply provided with spreading, castaneous, unicellular trichomes, these to 3 mm long and intermixed with minute, pluricellular, gland-tipped ones. **Lamina** chartaceous, lanceolate or elliptic, somewhat or scarcely reduced at base, pinnatisect nearly to the rachis, the segments strongly ascending, narrow-deltate, obtuse to acute, amply to abundantly provided with trichomes like those of the petiole. **Veins** distinct or indistinct, 1–3-forked, the branches frequently merging distally to form areoles, hydathodes lacking. **Sori** superficial, roundish, forming a single series on each side of the costa, medial to inframedial, borne on the acroscopic vein branch, sporangia intermixed with brownish, glandular, viscid paraphyses (these rarely evident in mature sori).

In wet forests, pendent from tree trunks or occasionally on stone walls, very rarely terrestrial on grassy páramos, 1800–3400 m, Amazonas, San Martín, and Cuzco.

Costa Rica and Panama; Colombia to Bolivia.

This species is easily recognized within the genus by its large leaves, which lack hydathodes and have frequently anastomosing veins that are commonly distinct enough to be seen when held to light. *Grammitis dudleyi* and *G. werffii* are two other species in Peru that Bishop (1989b) included in his new genus *Zygophlebia*. Both have veins that form areoles (at least occasionally), but their laminae are so thick that the veins are impossible to discern without clearing the tissue. See treatment of these species for further discussions.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla above Leimebamba, *Huichison & Wright 5554* (F, GH, NY, US), *Wurdack 1743* (US), *Wurdack 1765* (GH, NY, UC, US, USM). Prov. Chachapoyas, *Mathews "3281"?* (B). **San**

Martin: Prov. Mariscal Cáceres, Chochos, NW corner of Río Abiseo Park, *Young & León 4744* (USM). Prov. Chanchamayo, Mina Pichita, above San Ramón, *van der Werff et al. 8663* (MO). **Cuzco:** Altura de Sicre, *Bües 1538* (us), *1556* (us). Prov. Urubamba, trail to Intipata, *León & Cano 2100* (F, USM).

26. **Grammitis dudleyi** (Bishop) Stolze, *comb. nov.*

Zygophlebia dudleyi Bishop, Amer. Fern J. 79: 113. 1989. TYPE: Peru, Cuzco, Prov. La Convención, Cordillera Vilcabamba, NE of Río Apurímac, *Dudley 11144* (holotype, NA; isotypes, GH!, US!).

Plants epiphytic. **Stem** short-creeping or ascending, provided with linear or lanceolate, rather flaccid orange or yellow-brown scales, these 1.5–4 mm long, 0.4–0.8 mm broad, subclathrate, with margins entire. **Leaves** monomorphic, articulate to the stem, 35–60 cm long, 6–8 cm broad. **Petiole** 18–30 cm long, 1–2 mm in diameter, dull yellowish or reddish brown, sparsely to densely provided with spreading, castaneous, unicellular trichomes, these to 5 mm long. **Lamina** coriaceous, deltate, not or scarcely reduced at base, deeply pinnatisect to nearly pinnate, the segments rather strongly ascending and subdistant, linear-deltate, acute, the rachis and (sometimes) segments provided with widely scattered trichomes as on the petiole, or glabrate. **Veins** completely obscure (even when held to light), 1–2-forked, the branches often connivent distally and occasionally merging to form irregular areoles, hydathodes lacking. **Sori** slightly impressed, round to slightly elongate, in a single series between costa and margin, at maturity often reaching both costa and margin.

On trees, in thickets and cloud forests, 1550–3400 m, Huánuco and Cuzco.

Apparently endemic.

Although veins were completely obscured within the thick segment tissue, careful clearing will reveal them to be essentially free. However, there is a tendency for vein branches to curve distally toward adjacent ones and occasionally even to merge. This tendency toward areolate venation, along with other characters, indicates a relationship with *G. mathewsi* and *G. werffii*, under which may be seen further discussion.

Huánuco: SW slope of Río Llullapichis watershed, ascent of Cerros del Sira, *Dudley 13249* (GH), *13406* (GH). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, facing Apurímac Valley, *Dudley 11218* (GH, us).

27. **Grammitis werffii** (Bishop) Stolze, *comb. nov.*

Zygophlebia werffii Bishop, Amer. Fern J. 79: 115. 1989. TYPE: Peru, Pasco, border between Prov. Oxapampa and Prov. Pasco, *van der Werff et al. 8570* (holotype, UC!; isotype, MO!).

Plants terrestrial. **Stem** stout, short-creeping to ascending, densely provided with linear, rigid, lustrous, deep orange to brown scales, these 5–10 mm long, 0.4–0.7 mm broad, nonclathrate, sparingly to amply setulose, the setulae whitish and spreading. **Leaves** monomorphic, articulate and approximate on the stem, 25–50 cm long, 3.5–7 cm broad. **Petiole** 6–26 cm long, 1–2 mm in diameter, lustrous, deep castaneous to blackish, often glabrescent near the base, but distally rather densely provided with castaneous, rigid, unicellular trichomes, these 0.1–0.4 mm long. **Lamina** subcoriaceous, linear to narrow-elliptic or -oblong, not or scarcely reduced at base, deeply pinnatisect or fully 1-pinnate proximally, the segments patent, linear, acute, the rachis with abundant trichomes like those of the petiole, the segments with scattered, minute, glandular, simple or branched pluricellular trichomes on surface and margins. **Veins** completely obscure (even when held to light), commonly once-forked, many of them merging distally to form areoles, hydathodes lacking. **Sori** superficial, commonly round, in a single series on each side of the costa, essentially medial between costa and margin, sporangia intermixed with brownish, glandular, viscid paraphyses (these mostly evident in immature sori).

In elfin and cloud forests, on clay banks or in sphagnum, 1900–2700 m, Huánuco and Pasco.

Apparently endemic.

This is included by Bishop in his new genus *Zygophlebia*, related to *G. mathewsi* and *G. dudleyi* in Peru by anastomosing veins, among other characters. However, veins are so completely obscure in *G. werffii* and *G. dudleyi* that the character cannot be used effectively in the key. Consequently, more practical means have been employed to key out these species.

Huánuco: Vilcabamba, Hacienda on Río Chinchao, *Macbride 5145* (F, in part).

28. **Grammitis bipinnata** Stolze, *sp. nov.*

Caulis erectus vel repens, paleis lanceolatis, non clathratis, castaneis, 1–2 mm longis, setulosis, setulis niveis vel hyalinis. Folia 10–30 cm longa, 2–

6 cm lata, subfasciculata. Petiolus 3–20 cm longus, 0.3–0.5 mm latus, trichomatibus 0.1–0.3 mm longis, simplicibus vel ramosis, septatis, et trichomatibus 1.5 mm longis, castaneis, unicellularis intermixtis. Lamina bipinnata, basis abrupte reducta, paleis iis petioli equalibus. Pinnae 10–20 jugae, ascendentes. Venae simplices vel ramosae. Hydathodi nulli.

Plants pendent, probably epiphytic. **Stem** suberect or very short-creeping, provided with lanceolate, nonclathrate scales, these 1–2 mm long, lustrous, castaneous, the margins with rigid, whitish or hyaline setae. **Leaves** lax, articulate to the stem, crowded to subfasciculate, 2-pinnate (rarely 3-pinnate), 10–30 cm long, 2–6 cm broad. **Petiole** 3–20 cm long, 0.3–0.5 mm in diameter, sparsely puberulent with simple or branched, septate trichomes 0.1–0.3 mm long, and with simple, spreading, unicellular, castaneous trichomes to 1.5 mm long, or glabrescent. **Lamina** firm-herbaceous, abruptly reduced at base, ovate or broadly lanceolate, with 10–20 pairs of ascending pinnae. **Rachis** thin and flexuous, amply provided with spreading, castaneous unicellular trichomes to 1.5 mm long, and also sparsely provided with simple or branched septate trichomes 0.1–0.3 mm long. **Pinnae** stalked, 1.5–7 cm long, linear, 1-pinnate (rarely 2-pinnate), costa and segment margins pilose as on the rachis, and costa also with minute septate trichomes, ultimate segments sessile, 0.7–3 mm long, 0.6–2 mm broad, obovate or spatulate. **Veins** indistinct or obscure, simple or 1-forked in the segments, hydathodes lacking. **Sori** round, usually 1 to a segment, sporangia glabrous.

TYPE—Peru, Cuzco, Prov. La Convención, Loma Grande, *Bües* 2167 (holotype, US!; isotype, F!; photo, F of US).

In wet forests, 3150–4100 m, Cuzco. Although no data are provided on any of the labels, the long and delicate, flexuous, pendent leaves suggest that this species may be epiphytic.

Endemic.

The type specimen and paratypes have all been determined previously as *Polypodium variabile* (= *Grammitis variabilis*), and there is certainly a superficial resemblance to the latter as well as to *G. heteromorpha*. However, hydathodes are present adaxially on the vein tips of these two species (although sometimes obscured by indument), whereas hydathodes are lacking in *G. bipinnata*. There are two kinds of long, unicellular laminar trichomes in *G. heteromorpha*: yellow or orange and

unbranched, and these mixed with others that are castaneous and stellately branched. The long, unicellular trichomes are yellowish and simple in *G. variabilis*, and castaneous and simple in *G. bipinnata*, but they are never stellate in these two species. Leaves of *G. bipinnata* and *G. variabilis* are at least 2-pinnate, but in *G. heteromorpha* they are 1-pinnate with lamina once or twice forked.

There has been much confusion attending the relationship of this species complex (see Copeland, 1956; Morton, 1967), and the entire group is in great need of revision. Further comparison of characters can be found in the treatment of *G. heteromorpha*.

Cuzco: Altura de Sicre, *Bües* 1553 (US). Raccaypata, Vilcabamba, *Bües* 1606 (US). Prov. La Convención, Loma Grande, *Bües* 2164 (F, GH, US), 2165 (US, monstrous form, with extremely long, pinnate pinnae), 2166 (US). Paucartambo, Acjanaco, subida a Quellhua Ccocha, *Cano & Baldeón* 4980 (F, USM).

29. ***Grammitis jamesonioides*** (Fée) Morton, Contr. U.S. Natl. Herb. 38: 108. 1967.

Polypodium jamesonioides Fée, Mém. foug. 7: 59, t. 21, f. 4. 1857. TYPE: Colombia, Dept. Santander, Ocaña, *Schlim* 399 (holotype, L!; photos, F, UC, US).

Plants epiphytic. **Stem** erect, small, sparsely provided with ovate, brown, nonclathrate scales, these less than 1 mm long, viscid, the margins entire or glandular-ciliolate. **Leaves** 1-pinnate, inconspicuously articulate, 12–30 cm long, 1–1.7 cm broad, axes and tissue moderately provided with appressed, septate, viscid trichomes, these 0.1–0.2 mm long, simple, or occasionally branched, whitish or hyaline. **Petiole** 0.5–5 cm long, 0.2–0.4 mm in diameter. **Lamina** firm-herbaceous to chartaceous, abruptly reduced at apex, gradually reduced at base, the basalmost pinnae rudimentary. **Pinnae** 0.5–1.2 cm long, 2–2.5 mm broad, approximate but discrete, ascending at a 70–80° angle, linear-to narrow-deltate, mostly acute, margins entire to crenulate, base rounded to truncate acroscopically, slightly decurrent basiscopically. **Veins** indistinct or obscure, free, short and unbranched, hydathodes present, but usually partially obscured by the broad, appressed laminar trichomes. **Sori** round, mostly inframedial, sometimes confluent at maturity.

On tree trunks in montane forests, ca. 3350 m, Cuzco.

Costa Rica; Colombia to Peru.

This may be confused with *G. farinosa*, from which it differs chiefly in its narrower leaves and viscid-puberulent, vs. farinose, lamina. With it probably should be included *Polypodium azuayense* Sodiro of Ecuador; however, this is not certain, for the type of the latter was not examined during this study.

Cuzco: Mollepata, Hacienda Pincopata, Bishop 2520 (UC). Prov. Calca, valley of Río Calca, Bües 1805 (US).

30. **Grammitis apiculata** (Klotzsch) Seymour, *Phytologia* 31: 176. 1975.

Polypodium apiculatum Klotzsch, *Linnaea* 20: 378. 1847. LECTOTYPE (designated here); Venezuela (as Colombia), Colonia Tovar, Moritz 247 (B!; photo, F; isoelectotype, US!). Syntype: British Guiana (Guyana) (Rich. Schomburgk 1213 (B!, cat. #091628); another sheet of no. 1213 (B!, cat. #088656) is *G. capillaris*).

Ctenopteris apiculata (Klotzsch) Copel., *Philipp. J. Sci.* 84: 417. 1956.

Ctenopteris subimpressa Copel., *Philipp. J. Sci.* 84: 463. 1956. TYPE: Peru, Junín, E of Quimiri Bridge near La Merced, Killip & Smith 23842 (holotype, US!; photo, F).

Lellingeria apiculata (Klotzsch) Smith & Moran, *Amer. Fern J.* 81: 83. 1991.

Plants epiphytic. **Stem** short-creeping or decumbent, provided with lanceolate or ovate, blackish or castaneous scales, these 1–3 mm long, clathrate, with margins amply setose, the setae hyaline or whitish. **Leaves** 10–28 cm long, 2–5 cm broad. **Petiole** 3–9 cm long, 0.5–0.8 mm in diameter, light or reddish brown, densely puberulent, the trichomes orange or whitish, 0.1–0.2 mm long. **Lamina** firm-herbaceous to chartaceous, oblong-deltate, subtruncate at base, or with a few proximal pairs of somewhat reduced pinnae, usually abruptly reduced at apex to a pinnalike apex, pectinate, incised nearly or quite to the rachis, the segments (or pinnae) patent or slightly ascending, linear, obtuse or subacute, the rachis sparsely to amply puberulent on both sides as on the petiole. **Veins** indistinct to obscure, simple, hydathodes distinct. **Sori** round, superficial or slightly impressed, medial.

In cloud forests or clearings, on trunks or branches of trees, 700–2600 m, Cajamarca, San Martín (?), Pasco, and Junín.

Hispaniola; Mexico; Honduras; Costa Rica; Guyana to Colombia, south to Bolivia.

Cajamarca: Prov. Jaén, Quebrada de Pajonal, above

Tabaconas, Fosberg 27804 (US). **Pasco:** Prov. Oxapampa, trail between Santa Rosa de Chives and the San Matías signpost, León 328 (F, USM). **Junín:** Prov. Satipo, Gran Pajonal S of Chequitavo, D. Smith 5147 (MO). **Department unknown:** “Cumbasamma Mts.” (Cumbasa, San Martín?), Steere (GH).

31. **Grammitis pseudocapillaris** (Rosenst.) Morton, *Contr. U.S. Natl. Herb.* 38: 108. 1967.

Polypodium pseudocapillare Rosenst., *Meded. Rijks-Herb.* 19: 17. 1913. TYPE: Bolivia, above Tablas, Herzog 2190a (holotype, L; isotypes, UC!, US).

Ctenopteris pseudocapillaris (Rosenst.) Copel., *Philipp. J. Sci.* 84: 407. 1956.

Lellingeria pseudocapillaris (Rosenst.) Smith & Moran, *Amer. Fern J.* 81: 86. 1991.

Plants epiphytic. **Stem** short-creeping or decumbent, provided with narrow-deltate, castaneous or blackish scales, these subclathrate, 1.5–3 mm long, with setose margins, the setae hyaline or whitish. **Leaves** fasciculate, usually pendulous, 8–50 cm long, 1.5–4 cm broad. **Petiole** 0.5–2 cm long, 0.2–0.6 mm in diameter, brown or reddish brown, sparsely to moderately puberulent, the trichomes simple, branched at base or stellate, orange or whitish, 0.1–0.3 mm long. **Lamina** firm-herbaceous, 1-pinnate, narrow-elliptic, strongly reduced at apex and base, the rachis somewhat to (commonly) strongly flexuous, sparsely puberulent as on the petiole. **Pinnae** ascending at 20–45° angles, narrow-deltate to linear (proximal ones mere auricles), approximate to well spaced, inequilateral at base, subtruncate or rounded acroscopically, decurrent basiscopically. **Veins** indistinct or obscure, free, simple, hydathodes evident. **Sori** round, superficial or slightly impressed, inframedial.

On tree trunks in montane forests, 3050–3740 m, Cuzco.

Colombia to Bolivia.

In addition to the key characters, this can often be distinguished from the closely related *G. subsessilis* by the occurrence of some branched and stellate trichomes mixed among the simple ones, especially on the petiole. Petiole trichomes of *G. subsessilis* are always simple.

Cuzco: Huadquiña, Bües 1010 (US). 15 km from Quillabamba, Ellenberg 4774a (GH). Prov. Paucartambo, forest on Cerro Macho Cruz, León et al. 2784 (F, USM). **Department unknown:** Mathews 1102 (BM).

32. **Grammitis tunguraguae** (Rosenst.) Morton, *Contr. U.S. Natl. Herb.* 38: 109. 1967.

Polypodium tunguraguae Rosenst., Repert. Spec. Nov. Regni Veg. 7: 307. 1909. TYPE: Ecuador, Prov. Tungurahua, Mt. Tungurahua, *Spruce* (holotype, P, Herb. Bonap.; isotype, BM, frag., US!).

Ctenopteris tunguraguae (Rosenst.) Copel., Philipp. J. Sci. 84: 394. 1956.

Lellingeria tunguraguae (Rosenst.) Smith & Moran, Amer. Fern J. 81: 88. 1991.

Plants terrestrial or epipetric. **Stem** short-creeping or decumbent, provided with narrow-lanceolate, gray-brown scales, these 1–2 mm long, clathrate, margins densely setose, the setae hyaline or pale orange. **Leaves** 5–15 cm long, 0.8–1.5 cm broad. **Petiole** 0.5–4 cm long, 0.3–0.4 mm in diameter, light or reddish brown, densely puberulent, the trichomes orange or whitish, 0.1–0.2 mm long. **Lamina** firm-herbaceous to chartaceous, 1-pinnate, narrow-elliptic, strongly reduced at both ends, the rachis atropurpureous or blackish, sparsely puberulent abaxially, densely so adaxially. **Pinnae** patent or slightly ascending, oblong, obtuse at apex, adnate and subequilateral at base, subtruncate to slightly dilated. **Veins** indistinct to obscure, simple, hydathodes evident. **Sori** round, superficial or slightly immersed, medial to inframedial.

In forests or at edges of roads, on the ground or in rock crevices, 2000–3000 m, Cajamarca and Cuzco.

Ecuador; Peru.

This is one of the most diminutive of the fully pinnate species of *Grammitis*, with which smaller specimens of *G. apiculata* might be confused. However, the latter is epiphytic, with lamina subtruncate at the base and segments relatively much longer and narrower.

Cajamarca: Prov. Cutervo, La Pucarillo, *López et al.* 6718 (F, HUT). **Cuzco:** Machu Picchu, *Bishop* 1999 (UC), 2516 (UC). Prov. Urubamba, summit of Huayna Picchu, *Hutchison* 1755 (F, K, NY, UC). Prov. Paucartambo, border of Manú National Park, road to Pilcopata, *León* 2175 (USM).

33. *Grammitis subsessilis* (Baker) Morton, Contr. U.S. Natl. Herb. 38: 107. 1967.

Polypodium pteropus Hooker, Sp. fil. 4: 192, t. 275B. 1863, not Blume, 1828. LECTOTYPE (designated here): Ecuador, Mt. Abitagua, *Spruce* 5276 (K!).

Polypodium subsessile Baker, in Hooker & Baker, Syn. fil. 329. 1867, nom. nov. for *P. pteropus* Hooker and with the same type.

Ctenopteris pteropus John Sm., Hist. fil. 185. 1875.

Ctenopteris subsessilis (Baker) Copel., Philipp. J. Sci. 84: 411. 1956.

Lellingeria subsessilis (Baker) Smith & Moran, Amer. Fern J. 81: 87. 1991.

Plants epiphytic, occasionally epipetric. **Stem** short-creeping or decumbent, provided with deltate, gray-brown to blackish scales, these 2–4 mm long, obviously clathrate, the proximal lumina in 5–10 series across the scale and clear, margins densely setose, the setae hyaline or whitish. **Leaves** often pendulous, (8–)12–40 cm long, (2–)3.5–7 cm broad. **Petiole** 0.5–3 cm long, (0.4–)0.5–0.9 mm in diameter, brown or blackish, moderately to densely puberulent, the trichomes unbranched, orange or whitish, 0.1–0.2 mm long. **Lamina** firm-herbaceous to chartaceous, 1-pinnate or deeply pinnatisect, elliptic, strongly reduced at apex and base, the rachis straight or slightly flexuous, sparsely puberulent abaxially, densely so adaxially. **Pinnae** spreading or (more commonly) strongly ascending, narrow-deltate to linear (proximal ones mere auricles), usually well spaced and joined by a narrow herbaceous wing at a broadly rounded sinus, segment base subequilaterally and conspicuously dilated on each side. **Veins** obscure, free, simple, hydathodes evident. **Sori** round, slightly to rather deeply impressed, inframedial.

In cloud or elfin forests, usually pendulous on trees, or occasionally growing on mossy rocks or rocky cliffs, 1300–3750 m, Amazonas, Huánuco, Pasco, and Cuzco.

Costa Rica; Panama; Venezuela; Colombia to Bolivia.

Of the five syntypes (κ) cited from Colombia and Ecuador, *Spruce* 5276 is selected as lectotype because it best displays the typical variation of the lamina shape in this species and also was apparently the specimen from which Hooker's original illustration was drawn.

Leaves of this species can be highly variable; those of some specimens are greatly reduced in size but more erect, but this probably is due to their growing on rocks. Epiphytes are invariably pendulous, much longer, and rather flexuous.

Ctenopteris obovata Copel. (syn. *Polypodium pendulum*, var. *boliviense* Rosenst.), from Bolivia, probably should be included here, at least as a low-elevation variant. It differs from *G. subsessilis* only in its very short and broad lamina. *Grammitis recondita* Morton (Ecuador) is very similar in general aspect, for the rachis is thin and flexuous and pinnae are strongly ascending and have inequilateral bases. However, hydathodes are lacking in *G.*

recondita, lamina texture is very thin, and the few reduced basal pinnae are neither auriculiform nor broader than long.

Amazonas: Mendoza, *Woytkowski* 8216 (GH, MO). **Huánuco:** SW slope of Río Lullapichis watershed, slopes of Cerros del Sira, *Dudley* 13409 (GH). Cani, 7 mi NE of Mito, *Macbride* 3396 (F, US). **Pasco:** Prov. Oxapampa, summit of San Matías, *León et al.* 318 (F, USM). Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al.* 8492 (MO). **Cuzco:** Cerro Chuyapi, *Bües* A39 (US). Prov. La Convención, Cordillera Vilcabamba, *Dudley* 11106 (GH). Prov. La Convención, Canchyoy?, *Vargas* 23314 (GH).

34. **Grammitis major** (Copel.) Morton, Contr. U.S. Natl. Herb. 38: 109. 1967.

Polypodium tenuiculum var. *acrosorum* Hieron., Bot. Jahrb. Syst. 34: 510. 1904, as “*acrosora*,” not *P. acrosorum* Kunze, 1834. TYPE: Ecuador, Azuay, near Yerbabuena, *Lehmann* 5727 (holotype, b?; isotypes, F!, US).

Ctenopteris major Copel., Philipp. J. Sci. 84: 455. 1956. Type same as for *Polypodium tenuiculum* var. *acrosora*.

Lellingeria major (Copel.) Smith & Moran, Amer. Fern J. 81: 84. 1991.

Plants epiphytic or (outside Peru) terrestrial or epipetric. **Stem** short-creeping or decumbent, provided with deltate or oblong-deltate, gray- or light brown, iridescent scales, these (4–)5–7 mm long, narrow-clathrate, the proximal lumina (12–)15–20 across and mostly occluded, margins densely setose, the setae hyaline or whitish. **Leaves** 15–38 cm long, 2–5 cm broad. **Petiole** 2–9 cm long, 0.6–1.2 mm in diameter, reddish brown to atropurpureous, moderately to densely puberulent, the trichomes pale orange to white, 0.1–0.3 mm long. **Lamina** chartaceous, deeply pinnatisect to 1-pinnate, narrow-elliptic, strongly reduced at both ends. **Rachis** castaneous to atropurpureous, adaxially densely puberulent like the petiole, glabrous or sparsely puberulent abaxially. **Pinnae** patent or slightly ascending, deltate, obtuse to subacute at apex, adnate and subequally dilated at base. **Veins** indistinct to obscure, simple, hydathodes evident. **Sori** round or oblong, superficial or slightly immersed, medial, often confined to distal half of pinnae.

On tree trunks in humid forests and wooded ravines, 2560–3430 m, Cuzco.

Ecuador; Peru.

On the type and most other Ecuador specimens, sori are confined to the distal half of segments;

these segments are relatively broad and thin in texture. In others, including the Peruvian specimens, segments are thicker, more constricted, and sori occur throughout their length. No other characteristics have been observed to support separation into two separate taxa, and the condition is possibly due to individual plants’ responses to different habitats.

Cuzco: Prov. La Convención, Huayapata, 7 km from village of Incatambo, *Peyton & Peyton* 918 (GH, MO). Urubamba, Macchu Picchu, above Río Mandor, *Peyton & Peyton* 1314 (MO).

35. **Grammitis gracilis** (Hooker) Stolze, *comb. nov.*

Polypodium gracile Hooker, Bot. misc. 2: 239. 1831.

TYPE: Peru, Pasco, Huayllay, *Cruckshanks*, in 1830 (holotype, K; isotype, GH!; photo, F of GH!). *Ctenopteris gracilis* (Hooker) John Sm., Hist. fil. 185. 1875.

Habit unknown, dried plants with a faint aroma like that of pine leaves. **Stem** short-creeping, provided with narrow-deltate, gray-brown scales, these subclathrate, 2–3 mm long, the margins entire. **Leaves** subfasciculate, articulate to very short phyllopodia, pendulous, 18–26 cm long, to 2.2 cm broad. **Petiole** 5–7 cm long, 0.5–0.7 mm in diameter, light brown or castaneous, sparsely to amply puberulent, the trichomes simple or branched, septate, tortuous, 0.2–0.3 mm long. **Lamina** chartaceous, 1-pinnate-pinnatifid, narrow-elliptic, reduced at apex and base, the rachis slightly flexuous, puberulent as on the petiole. **Pinnae** strongly ascending at a 30–45° angle, sessile, linear or lanceolate, well spaced, incised about halfway to the costa into 4–6 pairs of broad, obtuse lobes. **Veins** obscure, simple, one in each segment and terminating in a hydathode adaxially.

Known thus far only from the type, ca. 4500 m, Pasco.

It is interesting to discover that the fragrance of the isotype still persists 160 years after it was collected. To the author it is much like the aroma of some species of *Pinus*, and the odor can be detected also in several related species, such as *G. andicola*, *G. firma*, *G. melanosticta*, *G. moniliformis*, and *G. xiphopteroides*. Most of these are to be included by Smith et al. in a new genus to be named *Melpomene*. The species is quite distinctive in its strongly ascending, pinnatifid pinnae, and it is curious that it has not been collected since 1830.

36. **Grammitis phlegmaria** (John Sm.) Proctor, *Rhodora* 68: 467. 1966.

Polypodium phlegmaria John Sm., *London J. Bot.* 1: 194. 1842. TYPE: Venezuela, Edo. Bolívar, near Mt. Roraima, *Schomburgk* 161 (holotype, k!; photos, F, US).

Ctenopteris phlegmaria (John Sm.) Copel., *Philipp. J. Sci.* 84: 435. 1956.

Lellingeria phlegmaria (John Sm.) Smith & Moran, *Amer. Fern J.* 81: 86. 1991.

Plants epiphytic. **Stem** erect, provided with ovate, brownish scales, these clathrate, 1–2 mm long, cordate at base, margins entire. **Leaves** essentially glabrous, fasciculate, articulate to the stem, pendent, 10–25 cm long, 1–1.7 cm broad. **Petiole** 0.2–0.5 cm long, 0.2–0.3 mm in diameter, brown or black. **Lamina** thin-herbaceous, pinnatisect nearly to rachis, linear to narrow-elliptic, reduced at apex and base, the rachis blackish or obscured by the laminar tissue. **Pinnae** sessile, broadly and obtusely deltate, entire, or (at least on the acroscopic margin) broadly crenulate, inequilateral at base, broadly rounded to subauriculate acroscopically, strongly decurrent basiscopically. **Veins** distinct or indistinct, free, short, pinnately branched in the segments, hydathodes evident. **Sori** round, 3–5 to a segment.

Thus far known in Peru from a single specimen, on trees, 2200 m, Cuzco.

Honduras; Costa Rica; Guyana; Venezuela; Colombia to Peru.

Proctor (*Rhodora* 68: 467. 1966) separated material from the Lesser Antilles as var. *antillana*, which differs from var. *phlegmaria* in the narrower and subtire segments.

Cuzco: Sahuayacu, Cerro Sombreruyoc, Bües 825 (US).

37. **Grammitis youngii** Stolze, *sp. nov.*

Plantae epiphyticae. Caulis repens, 1.0–1.4 mm crassus, paleis abundantibus, 5–7 mm longis, 0.4–0.7 mm latis, clathratis, lanceolatis, attenuatis, basi cordatis. Folia 15–30 mm longa, 1.5–3 cm lata. Petiolus 3–9 cm longus, 0.6–1.2 mm latus, minute puberulus, trichomatibus 0.1–0.3 mm longis, septatis, simplicibus vel ramosis. Lamina coriacea, 1-pinnata vel profunde pinnatisecta, basis et apicis valde reducta. Pinnae lineato-deltatae, ascendentes, basi subaequilateris, marginibus integris et revolutis. Venae liberae, obscurae, hydathodis adsumt. Sori superficiali, mediali vel inframediali.

Plants epiphytic. **Stem** short- to long-creeping, 1–1.4 mm in diameter, pruinose, abundantly provided with iridescent brown or gray-brown scales, these 5–7 mm long, 0.4–0.7 mm broad, lanceolate, attenuate, clathrate, cordate at base, margins entire. **Leaves** approximate to well spaced, neither articulate nor aromatic, 15–30 cm long, 1.5–3 cm broad. **Petiole** 3–9 cm long, 0.6–1.2 mm in diameter, brown or blackish, sparsely to moderately puberulent, the trichomes 0.1–0.3 mm long, septate, simple or branched. **Lamina** coriaceous, incised nearly or quite to the rachis, narrow-elliptic, strongly reduced to apex and base, the rachis and adaxial laminar tissue sparsely and minutely puberulent as on the petiole, or glabrescent. **Pinnae** sessile, linear-deltate, 6–8 times as long as broad, ascending at a 60–70° angle, the margins entire and usually revolute, subequilateral at base, subtruncate acroscopically, slightly dilated basiscopically. **Veins** obscure, free, short and ascending, 6–12 on each side of the costa, each terminating in a hydathode adaxially. **Sori** superficial, round, medial or inframedial, lacking paraphyses.

TYPE—Peru, San Martín, Prov. Mariscal Cáceres, Puerta del Monte, forest patch above timberline, *Young* 1684 (holotype, USM!; isotype, F!).

Apparently endemic. On trees in forests or forest patches, 3000–3400 m, Piura, Amazonas, San Martín.

This is named for Dr. Ken Young, who not only gathered half of the known specimens but has been collecting in Peru for several years. The species is part of the group of *G. moniliformis*, which is distinguished by large, clathrate, stem scales with entire margins and a cordate base, coriaceous pinnae with revolute margins, and laminae having scattered, septate, often branched trichomes on the petiole and rachis instead of long, spreading trichomes. Pinnae of *G. youngii* are linear-deltate and somewhat ascending.

Piura: Road from Piura to Huancabamba, El Tambo, *Scolnik* 1413 (US). Amazonas: E of Balsas, *Osgood & Anderson* 70 (F). San Martín: Prov. Mariscal Cáceres, Río Abiseo National Park, near Mirador, *León* 2132 in part (UC). Prov. Mariscal Cáceres, NW corner of Río Abiseo National Park, *Young & León* 4559 (USM), 4609a (USM).

38. **Grammitis melanosticta** (Kunze) Seymour, *Phytologia* 31: 179. 1975.

Polypodium melanostictum Kunze, *Linnaea* 9: 44. 1834. TYPE: Peru, Cuesta de Carpis, *Poeppig*, in 1829 (holotype, LZ, destroyed; isotype, w).

Ctenopteris melanosticta (Kunze) Copel., Philipp. J. Sci. 84: 385. 1956.

Plants epipetric or epiphytic, scarcely to strongly aromatic. **Stem** short-creeping to erect, provided with a few ovate or lanceolate, clathrate scales, these 1–2(–2.5) mm long, 0.3–0.5 mm broad, margins entire, cordate at base, the cells 6–10 across at widest point, their walls blackish, not or scarcely lustrous. **Leaves** glabrous, or with a few scattered, septate trichomes ca. 0.1 mm long on the petiole and rachis abaxially, approximate to fasciculate, not articulate, 6–17 cm long, 0.7–1.2 cm broad. **Petiole** ca. 1 cm long, 0.4–0.6 mm in diameter, brown or blackish. **Lamina** subcoriaceous, pinnatisect nearly to the rachis, linear to narrow-elliptic, reduced at apex and base, the rachis blackish. **Segments** about twice as long as broad, patent, joined near the rachis by a narrow wing, oblong, obtuse, margins entire and essentially plane, subequilateral at base, subtruncate acroscopically, slightly dilated basiscopically, dotted with reddish stomates abaxially. **Veins** indistinct or obscure, free, 2–3 pairs ascending from the costa and each terminating in a hydathode adaxially. **Sori** round, 1–4 to a segment.

On dry rock faces or on tree trunks in forests, 600–1800 m, San Martín, Huánuco, Junín.

Southern Mexico; Guatemala; Costa Rica; Cuba; Hispaniola; Venezuela; Colombia to Bolivia.

Although rather widespread in its distribution, collections of this species are nowhere very common, but perhaps it has been overlooked because of its small and inconspicuous leaves. Stolze (Fieldiana, Bot., n.s., 6: 261. 1981) included it with *G. moniliformis* in Guatemala, and indeed the two are very similar. The principal difference is in the stem scales, which are large and iridescent in *G. moniliformis*, usually with brown cell walls, whereas scales of *G. melanosticta* are small and inconspicuous, scarcely lustrous, and with blackish cell walls. Also, lamina segments of the latter are consistently about twice as long as broad and dotted with red stomates; segments of *G. moniliformis* are commonly (but not always) about as broad as long and are eglandular.

It is not certain if the description has been properly applied to the name of this species, for no type material was available for this study. However, in the original description the segments are described as “subtus punctulatis,” which apparently refers to the red stomates. Nearest allies of this species, at least in Peru, have normal stomates.

San Martín: Prov. Mariscal Cáceres, Tocache Nuevo, J. Schunke V. 5723 (F, NY). **Huánuco** (as San Martín): E of Tingo María, Allard 20603, 20731, 21363, 21469 (all us). **Junín:** La Merced, Hacienda Schunke, Macbride 5638 (F). Chanchamayo Valley, C. Schunke 315 (F), 1548 (F).

39. *Grammitis erecta* Morton, Phytologia 22: 72. 1971. TYPE; Ecuador, Mt. Tunguragua, Spruce 5279a (holotype, K).

Plants terrestrial or epipetric, not aromatic. **Stem** long-creeping, usually decumbent, sometimes pruinose, 1–3 mm in diameter, abundantly provided with lanceolate, iridescent, clathrate scales, these 4–8 mm long, 0.5–1 mm broad, margins entire, cordate at base, the cells 15–40 across at the widest point, their walls light or reddish brown. **Leaves** with a few, scattered, minute, appressed, septate trichomes ca. 0.1 mm long, or glabrescent, well spaced, erect and continuous on the stem, 10–18 cm long, 0.7–1.4 cm broad. **Petiole** 1–4 cm long, 0.7–1 mm in diameter, brown. **Lamina** coriaceous, deeply pinnatisect, linear to narrow-elliptic, reduced at apex and base, the rachis reddish brown. **Segments** 2–4 times as long as broad, patent, medial ones narrowly or broadly oblong, obtuse, margins entire and revolute, subequilaterally dilated at base. **Veins** obscure, free, 3–4 pairs to a segment, each terminating in a hydathode adaxially.

On wet hummocks or bryophytes or on wet rocks, 3100–3500 m, Cuzco.

Venezuela; Ecuador; Peru.

The habit of *G. erecta* is distinctive. The stem is stout and very long-creeping, eventually ascending, and upon it are borne well-spaced, rigid, very narrow, ascending leaves. The 30–60 pairs of rigid segments are perpendicular to the rachis. The species is closely allied with *G. moniliformis* and, thus far, is known in Peru from but one collection.

Cuzco: Prov. La Convención, Cordillera Vilcabamba, Dudley 11062 (GH).

40. *Grammitis moniliformis* (Sw.) Proctor, Brit. Fern Gaz. 9: 219. 1965.

Polypodium moniliforme Sw., Syn. fil. 33. 1806. TYPE: Peru, ex *Lagasca* (holotype, s; photos, GH, US). *Ctenopteris moniliformis* (Sw.) John Sm., Hist. fil. 184. 1875.

Plants terrestrial, epipetric, or epiphytic, aromatic. **Stem** short- to long-creeping, 1–3 mm in diameter, abundantly provided with ovate to lan-

ceolate, clathrate, iridescent scales, these 3–8 mm long, 0.1–1.2 mm broad, margins entire, base cordate, the cells (12–)16–30 across at the widest point, their walls reddish brown. **Leaves** approximate to subfasciculate (rarely to 1 cm apart), not articulate, 4–25 cm long, 0.4–1.5 cm broad. **Petiole** 0.7–6 cm long, 0.4–1 mm in diameter, brown (rarely blackish at base), sparsely to moderately provided with septate, simple or branched trichomes about 0.1 mm long, but occasionally with some dark, rigid ones to 1 mm long. **Lamina** coriaceous, cut nearly or quite to the rachis, linear, reduced at apex and base, the rachis brown, glabrous, or puberulent as on the petiole. **Pinnæ** (or segments) 1–1.5 times as long as broad, patent, semicircular to broadly oblong, obtuse, margins entire and mostly revolute, subequilateral at base, glabrous. **Veins** obscure, free, with 1–2 short branches that terminate in hydathodes adaxially. **Sori** round, several to a pinna, slightly impressed.

In forests on tree trunks, humus or rocky soil, or on open road cuts or exposed rock cliffs, (1800–) 2150–4600 m, Piura to Amazonas, south to Ayacucho, Cuzco, and Puno.

Southern Mexico to Panama; Greater Antilles; Colombia and Venezuela south to Bolivia and Brazil.

This is perhaps the most common species of *Grammitis* in Peru, and it is found in many habitats. Its leaves vary considerably depending upon where the plant grows. Those on tree trunks, especially in elevations below 2500 m, tend to be more robust, with longer and broader laminae, whereas the plants found on rocks or crevices of cliffs and in higher elevations are apt to be narrow and stunted. The robust plants are sometimes separated as *G. assurgens* (Maxon) Morton (Ecuador), but they differ in no other way than size, and even this is not wholly consistent with their habitat or elevation. Several higher elevation specimens from Peru are quite robust. Leaves consistently have the pungent odor discussed under *G. gracilis*.

Besides *G. assurgens*, there are several other taxa that form a natural group with *G. moniliformis*, but these definitely merit distinction. *Grammitis erecta* and *G. melanosticta* (under which see further comparisons) are similar in leaf shape but have other clear but subtle differences. Although *G. youngii* surely belongs in this group, it can be more quickly distinguished by its broad lamina and linear segments. Perhaps *G. moniliformis* is most easily confused with *G. flabelliformis* (under which see further discussion).

Piura: Prov. Huancabamba, above Canchaque on road to Huancabamba, *Hutchison 1638* (UC). **Lambayeque:** Prov. Ferreñafe, near Cerro Punamachay on trail to Laguna Hualtaco, *Dillon & Skillman 4117* (F, GH). **Cajamarca:** Prov. Chota, Laguna Yahuarcocha above Incahuasi, *Sagástegui et al. 12899* (F, GH). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla above Leimebamba, *Hutchison & Wright 5665* (F, GH, UC). **La Libertad:** Prov. Bolívar, Las Quinuas, *López & Sagástegui 3347* (F, GH, MO, UC). **San Martín:** Prov. Mariscal Cáceres, NW corner of Río Abiseo National Park, *Young & León 4542* (USM), 4750 (USM). **Ancash:** Above Yungay near Laguna Llanganuco, *Tryon & Tryon 6560* (GH). **Huánuco:** Carpath, *Coronado 63* (GH, UC, US). **Lima:** Near Antaicocha, Cerro Colorado, E of Canta, *Pennell 14692* (F, GH, US). **Pasco:** Prov. Oxapampa, Dist. Chontabamba, road to top of San Gutardo, *León et al. 525* (USM). **Huancavelica:** Prov. Huánuco, Machajhuay, *Tovar 877* (GH, USM). **Ayacucho:** Pampalca, between Huanta and Río Apurímac, *Killip & Smith 23295* (NY, US). **Apurímac:** Forests of Ampay, *Vargas 1063* (GH). **Cuzco:** Prov. La Convención, NE of Hacienda Luisiana and Río Apurímac, *Dudley 11138* (GH, US). **Madre de Dios:** Piñasnioj, *Cook 1926* (US). **Puno:** Prov. Sandia, between Sandia and Cuyocuyo, *Ferreira 16812* (GH, USM).

41. *Grammitis anfractuosa* (Klotzsch) Proctor, *Rhodora* 63: 35. 1961.

Polypodium anfractuosum Klotzsch, *Linnaea* 20: 375. 1847. TYPE: Venezuela, Mérida, *Moritz 330* (holotype, b!, photo, F; isotypes, b!, us).

Polypodium monticola Klotzsch, *Linnaea* 20: 377. 1847; reduced to *P. anfractuosum* by Hieronymus (Hedwigia 48: 251. 1909). LECTOTYPE (designated here); Peru, Huánuco, Muña, *Ruiz 58* (b!, photo, F; frag., b!).

Ctenopteris anfractuosa (Klotzsch) Copel., *Philipp. J. Sci* 84: 431. 1956.

Plants epiphytic, rarely epipetric. **Stem** small, usually ca. 1 mm thick, bearing 1–few leaves at intervals along long-creeping, stoloniform roots, sparsely provided with narrow-deltate, gray-brown to blackish scales, these 1 mm or less, subclathrate (lumina much constricted), the margins naked. **Leaves** 5–14 cm long, 0.4–1.3 cm broad. **Petiole** 0.2–2 cm long, 0.2–0.5 mm in diameter, usually marginate throughout, sparsely or moderately provided with spreading, reddish to castaneous, unicellular trichomes, these 0.4–1 mm long. **Lamina** firm-herbaceous to chartaceous, linear-elliptic, deeply pinnatisect nearly to the rachis, strongly and gradually reduced at both ends, pilose as on the petiole, especially long and abundant among the sori. **Segments** 2–6 mm long, 1.5–2.5 mm broad, oblong or oblong-deltate, obtuse or subacute, occasionally host to black, clavate fungi, margins entire. **Veins** simple, obscure, the hydathodes distinct and sometimes encrusted with

small, calcareous deposits. **Sori** 1–2 pairs on a segment, sporangia glabrous.

In wet forests or wooded ravines, on stumps, logs, or trunks and branches of trees, rarely on moss-covered rocks, 1400–2750 m, along the Cordillera Central from Cajamarca and Amazonas to Cuzco.

Southern Mexico to Panama; Guadeloupe and the Greater Antilles; Guianas; Venezuela and Colombia to Peru.

This little fern is distinguished especially by the very small, erect stems that bear only one or a few leaves and that proliferate by long, slender, stoloniform roots. This habit has not been observed in any other species of *Grammitis* in Peru, although there are several species of *Asplenium* with the stems connected in this manner. The black, clavate fungi that so commonly infest species in the *G. semihirsuta* complex are found but occasionally on the lamina of *G. anfractuosa*, even though they have been reported as quite prevalent on specimens from Mexico and the Antilles.

Cajamarca: Prov. Jaén, Río Manchara valley E of Tabaconas, *Hodge* 6102 (US). **Amazonas:** Prov. Chachapoyas, Cerros Calla Calla above Leimebamba, *Hutchison & Bennett* 4754 (F), 4754 in part (GH, UC). Prov. Bongará, Dist. Yambrasbamba, *Tillett* 673-231 (F, GH). **San Martín:** Rioja, trail to Venceremos and Río Serranoyacu, *Knapp & Alcorn* 7776 (F, MO). Near Tarapoto, *Spruce* 4642 (GH, P, US). **Huánuco:** Prov. Huánuco, 5 km from Carpath Pass, between Acomayo and Chinchao, *Tryon & Tryon* 5310 (USM), 5310-1/2 (F, GH, US), *Tryon* 5310 at GH is *G. moniliformis*.

42. *Grammitis firma* (John Sm.) Morton, Contr. U.S. Natl. Herb. 38: 110. 1967.

Polypodium firmum Klotzsch, Linnaea 20: 378. 1847, not Kaulf., 1827. LECTOTYPE (designated by Looser, Rev. Univ. Chile 36: 75. 1951): Guyana, *Rich. Schomburgk* 1170 (B; isoelectotype, K!, photos, F & US of K).

Ctenopteris firma John Sm., Hist. fil. 184. 1875. *Nom. nov.* for *Polypodium firmum* Klotzsch and with the same type.

Polypodium aromaticum Maxon, Proc. U.S. Natl. Mus. 27: 743. 1904. TYPE: Jamaica, Blue Mt. Peak, *Underwood* 1449 (holotype, NY!; isotype, US!; photo, F of US).

Polypodium herzogii Rosenst., Repert. Spec. Nov. Regni Veg. 6: 176. 1908. TYPE: Bolivia, Prov. Cochabamba, Inca Corral, *Herzog* 783 (holotype, s; isotype, US!; photo, F of US).

Grammitis aromatica (Maxon) Proctor, Brit. Fern Gaz. 9: 218. 1965.

Plants epiphytic or epipetric, strongly aromatic.

Stem 1.5–4 mm in diameter, short-creeping to decumbent, provided with narrow-deltate or -lanceolate, thin, iridescent gray-brown scales, these 3–5 mm long, clathrate, 10–15 cells across at scale base and the lumina large, clear and elongate, margins naked. **Leaves** 8–28 cm long, (2–)3–7 cm broad. **Petiole** 1.5–7 cm long, amply provided with castaneous, rigid, unicellular trichomes to 1 mm long. **Lamina** 1-pinnate, chartaceous to subcoriaceous, elliptic or oblong-elliptic, slightly and abruptly reduced at base, dark unicellular trichomes 0.5–1 mm long on tissue and rachis abaxially, 0.3–0.5 mm long on rachis adaxially. **Pinnae** (0.6–)1–4 cm long, linear, many proximal ones deflexed, (4–)6–14 times longer than broad, adnate, acute or subacute, conspicuously inequilateral at base, strongly dilated acroscopically, subtruncate basiscopically, margins entire and usually strongly revolute. **Veins** simple, 8–20 pairs on a pinna, hydathodes distinct. **Sori** 6–12 pairs on larger pinnae, sporangia glabrous.

In wet forests, on tree trunks, on boulders, and among rocks, 1900–3050 m, along the Cordillera Central from Cajamarca and Amazonas to Cuzco.

Jamaica; southern Mexico; Guatemala; Costa Rica; Venezuela and Guyana; Colombia to Bolivia.

The character most clearly distinguishing this species from its nearest allies is the many rigid, linear pinnae that are strongly deflexed in the proximal half of the lamina. It is also distinctive in the pungent odor of its leaves, persistent even on older herbarium specimens, as discussed under *G. gracilis*.

Cajamarca: Colasay, *Woytkowski* 7009 (MO, US). **Amazonas:** Leimebamba, *Woytkowski* 7839 (MO, US). **Huánuco:** Carpath, *Coronado* 79 (US). Prov. Huánuco, Mirador along road from Acomayo to Chinchao, *Mexia* 4142 (UC). **Pasco:** Prov. Oxapampa, “Palamazú” (Palcazú), *van der Werff et al.* 8411 (MO). **Junín:** Prov. Tarma, Agua Dulce, *Woytkowski* 35480 (UC). **Cuzco:** Prov. Urubamba, Machu Picchu, *Ferreya* 9889 (GH). Prov. Urubamba, Machu Picchu near Wiñay Wayna, *León et al.* 2108 (F).

43. *Grammitis pilosissima* (Mart. & Gal.) Morton, Contr. U.S. Natl. Herb. 38: 114. 1967.

Polypodium pilosissimum Mart. & Gal. Nouv. Mém. Acad. Roy. Sci. Bruxelles 15: 39, t. 9, f. 2. 1842. LECTOTYPE (designated by A. R. Smith, Fl. Chiapas 2: 124. 1981): Mexico, Veracruz, Zacuapan, *Galeotti* 6379 (BR, frag., US; isoelectotype, K; photo, US of BR).

Ctenopteris pilosissima (Mart. & Gal.) Copel., Philipp. J. Sci. 84: 390. 1955.

Plants epiphytic, rarely epipetric, not or slightly aromatic. **Stem** 1–3 mm in diameter, short- to long-creeping, provided with narrow-deltate or lanceolate, thin, iridescent, gray-brown scales, these 3–6 cm long, clathrate, 8–15 cells across at scale base and the lumina large, clear and elongate, scale margins naked. **Leaves** 8–27 cm long, 0.8–1.5 cm broad. **Petiole** 1.5–9 cm long, amply provided with castaneous, unicellular trichomes 1–2.5 mm long. **Lamina** 1-pinnate, chartaceous to subcoriaceous, elliptic, not or abruptly reduced at base, proximal 0–3 pairs somewhat shorter than longest ones, rachis on both sides with dark, unicellular trichomes about 1 mm long or glabrescent. **Pinnæ** (0.5–)1–4 cm long, narrowly oblong-deltate to linear-deltate, mostly ascending at 60–80°, 4–10(–16) times longer than broad, adnate, acute, slightly and subequilaterally dilated at base, margins entire and usually strongly revolute. **Veins** simple, 4–16 pairs on a pinna, hydathodes distinct. **Sori** (3–)4–12 pairs on larger pinnæ, sporangia glabrous.

In wet forests or thickets, on trunks and branches of trees, rarely on rocks, (2000–)2450–4000 m, Piura, La Libertad, San Martín, Huánuco, and Cuzco.

Southern Mexico; Guatemala; Costa Rica; Venezuela and Colombia to Brazil and Bolivia.

This species varies greatly in size, especially in South America, and specimens at the extreme size limits understandably may be determined as different species. Leaf width in Mexico and Central America rarely exceeds 2.5 cm, and pinnæ are deltate or oblong-deltate; but in South America the lamina is often 3–4 cm broad, and many of the pinnæ are linear beyond the dilated base. *Grammitis pilosissima* is especially distinguished from related species by the acute, ascending pinnæ, with none or only a few of them shortened at the base of the lamina, whereas laminae of most allied species are strongly and gradually reduced to often rudimentary auricles. Long, dark, spreading, unicellular trichomes are usually ample on petiole, rachis, and lamina tissue (although sometimes broken away on dried specimens). With this probably should be included *Polypodium acrodontium* Fée of Brazil. Further comparison of allied species can be found under *G. xiphopteroides*.

Piura: Prov. Huancabamba, environs of Ayabaca, *Sagástegui & Cabanillas* 8701 (F, MO, UC). **La Libertad:** Prov. Patate, Puerta del Monte, *López & Sagástegui* 3452

(GH). **San Martín:** Dist. Huallaga, Valley of Río Apisoncho, *Hamilton & Holligan* 708, 736 (K). Prov. Mariscal Cáceres, Chochos, *Young* 2509 (USM), *Young & León* 4716 (USM). **Huánuco:** Tambo de Vaca, *Bryan* 629 (F, US). *Macbride* 4410 (F, US). **Cuzco:** Prov. Urubamba, Machu Picchu, *Núñez & Arque* 8339 (MO, UC), *Peyton & Peyton* 1103 (GH, MO).

44. *Grammitis xiphopteroides* (Liebm.) A. R. Smith, Amer. Fern J. 70: 26. 1980.

Polypodium xiphopteroides Liebm., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd. ser. 5, 1: 196. 1849. LECTOTYPE (designated by A. R. Smith, Fl. Chiapas 2: 125. 1981): Mexico, Veracruz. "Nac. de Mirador," *Liebm. Pl. Mex.* 2548 (C).

Polypodium rigens Maxon, Proc. U.S. Natl. Mus. 27: 741. 1904. TYPE: Jamaica, John Crow Peak, *Maxon* 1346 (US).

Ctenopteris rigens (Maxon) Copel., Philipp. J. Sci. 84: 422. 1956.

Grammitis rigens (Maxon) Proctor, Brit. Fern Gaz. 9: 219. 1965.

Plants epiphytic, rarely terrestrial, strongly aromatic. **Stem** 1.5–2 mm in diameter, short-creeping, provided with narrow-deltate to lanceolate, thin, iridescent, gray-brown scales, these 2–5 mm long, clathrate, 8–12 cells across at base and the lumina large, clear and elongate, scale margins naked. **Leaves** 6–30 cm long, (0.7–)0.9–2.3 cm broad. **Petiole** (0.5–)5–8 cm long, amply provided with reddish brown, spreading, unicellular trichomes 1–2(–3) mm long, but minute pluricellular ones rare or lacking. **Lamina** cut nearly or quite to rachis, chartaceous to subcoriaceous, linear or narrow-lanceolate, gradually reduced at base to 6–many short pinnæ or auricles, trichomes ample, 0.6–1 mm long on both sides of the rachis and longer on the segments, especially among the sori. **Pinnæ** (or segments) 0.5–1.2 cm long, 2.5–6 times longer than broad, patent or slightly ascending, adnate, mostly oblong, obtuse, subequilateral at base, either subtruncate or slightly dilated, margins plane to somewhat revolute. **Veins** simple, 4–10 pairs on a pinna, hydathodes evident. **Sori** 3–7 pairs, sporangia glabrous.

In wet forests, on trunks or branches of trees, rarely on wet clay banks, 800–2300(–2700) m, Cajamarca and Amazonas south to Cuzco.

Mexico to Panama; Greater Antilles; Venezuela and Colombia to Brazil and Bolivia.

This, *G. pilosissima*, and *G. flabelliformis* form a poorly understood species complex that is in great need of revision. Essentially the taxa are separated here on the basis of some subtle and not

too consistent features: apex, shape, and orientation of pinnae, degree of reduction of lamina base, and abundance or paucity of laminar trichomes. Most specimens can be separated by the key characters, but enough intermediates have been found to cast doubts as to whether there are one, two, or three discrete species. *Grammitis xiphopteroides*, as delimited here, is basically a lower elevation epiphyte, occurring mostly at 2000 m and below. The other two are generally found at 2500–4000 m, but *G. flabelliformis* is an epipetric species of exposed habitats, whereas *G. pilosissima* is an epiphyte in deep woods.

Cajamarca: Colasay, *Woytkowski 7016* (MO, US). **Ama-zonas:** Prov. Bagua, 12 km E of La Peca, *Barbour 2397* (MO). **Loreto:** Sierra del Pongo, *Mexia 6292a*. **Pasco:** Prov. Oxapampa, Abra Los Mellizos, 4 km from Eneñas, *Skog et al. 5041* (US). **Junín:** Schunke Hacienda above San Ramón, *Killip & Smith 24847* (NY, US). *24848* (NY). **Ucayali** (as Loreto): La Divisoria, between Tingo María and Pucallpa, *Ferreya 1689* (USM). **Cuzco:** Machu Picchu, *Bishop 2513* (UC).

45. *Grammitis flabelliformis* (Poiret) Morton, Contr. U.S. Natl. Herb. 38: 57. 1967.

Polypodium flabelliforme Poiret, in Lam., *Encycl.* 5: 519. 1804. LECTOTYPE (designated by Morton, 1967): Bourbon (Réunion), *Commerson* (p, *Herb. Juss.* 1098-C; photo, US, also Pichi-Sermolli photo in Webbia, 37: 121. 1983). *Polypodium rigescens* Willd. Sp. Pl. ed. 4, pl. 5: 183. 1810. TYPE: Bourbon, *Bory* (holotype, v, *Herb. Willd.* 19668; isotype?, k, figured by Hooker & Grev. *Icon. fil. t.* 216). *Polypodium peruvianum* Desv., *Mém. Soc. Linn. Paris* 6: 231. 1827. TYPE: Peru, *Dombey* (holotype, p, *Herb. Desv.*; possible isotypes, l, p; photo, US of l). *Ctenopteris peruviana* (Desv.) John Sm., *Hist. fil.* 184. 1875. *Ctenopteris rigescens* (Desv.) John Sm., *Hist. fil.* 184. 1875. *Grammitis peruviana* (Desv.) Morton, Contr. U.S. Natl. Herb. 38: 115. 1967. *Grammitis rigescens* (Willd.) Lell., *Proc. Biol. Soc. Wash.* 89: 383. 1985.

Plants epipetric or terrestrial, often slightly aromatic. **Stem** 1–2.5 mm in diameter, short- or long-creeping, provided with narrow-deltate to -lanceolate, thin, iridescent, gray-brown scales, these 2.5–5 mm long, clathrate, 8–12 cells across at scale base and the lumina large, clear and elongate, margins naked. **Leaves** 5–20 cm long, 0.4–1 (–1.4) cm broad. **Petiole** 1–7 cm long, moderately provided with minute (0.1–0.2 mm), simple or branched, septate trichomes, but dark, spreading,

unicellular ones sparse or lacking. **Lamina** cut nearly or quite to the rachis, chartaceous to subcoriaceous, linear, gradually reduced at base to 3–8 pairs of short and broad pinnae or auricles, castaneous, spreading, unicellular trichomes sparse or lacking on rachis, to 1.5 mm long on segments abaxially, especially among the sori. **Pinnae** 0.15–0.7 cm long, 1.5–2 times as long as broad, patent, adnate, deltate to oblong-deltate, obtuse or subacute, slightly and equally dilated or truncate at base, margins usually strongly revolute. **Veins** simple, 2–4 pairs on a pinna, hydathodes evident. **Sori** (1)–2–4 pairs on a pinna, sporangia glabrous.

On páramos, exposed slopes, high grasslands or open woods, on rocks, crevices of cliffs or on rocky ground, 2500–4800 m, Cajamarca south to Huan-cavelica and Puno.

Costa Rica; Hispaniola; Venezuela and Colombia to Brazil and Bolivia; Africa.

Long-standing confusion on the nomenclature and lectotypification of this and *G. rigescens* was resolved by Morton (Contr. U.S. Natl. Herb. 38: 57–59. 1967) and further substantiated by Bishop (Taxon 38: 91–95. 1989). However, Morton (*loc. cit.* 115) elected to separate *G. peruviana* from *G. flabelliformis* on the basis of the latter's sometimes longer stems and more distant leaves. Neither of these characters is significant nor consistent.

This is easily confused with *G. moniliformis*, another species with stout, creeping stems, linear leaves, and broad, obtuse pinnae that are often nearly as broad as long. However, in *G. flabelliformis* the lamina abaxially is amply provided with stout, castaneous trichomes, especially among the sori, and stem scales are narrow, with large, elongate lumina, these only 8–12 cells across at the base of the scale. Leaves of *G. moniliformis* are glabrous, and stem scales are broader, these with lumina commonly 16–30 across at scale base and most of the central ones nearly isodiametric.

Grammitis flabelliformis is most closely related to *G. pilosissima* and *G. xiphopteroides*. See treatment of the latter for further discussion of the relationship.

Cajamarca: Cerro Cumbe Mayo, *Sánchez V. 34* (GH, US). **La Libertad:** Prov. Huamachuco, 5 km S of Portachuelo Pass, *West 8147* (GH, UC, US). **Ancash:** NW slope of Nevada de Huascarán, below Llanganuco, *Correll & Smith P961* (GH, US). Prov. Yungay, Huascarán National Park, *D. Smith & Goodwin 8896* (MO), *8897* (MO). **Huánuco:** Chavinillo, *Coronado 177* (UC), *178* (UC), *806* (UC). **Pasco:** Huayllay, *Cruckshanks* (GH). **Junín:** San José, *Macbride & Featherstone 1110* (F, US). **Huancavelica:** Prov. Tayacaja, Huacracocha, 20 km from Huan-

cayo, *Tovar 2184* (GH, USM). **Apurimac:** Abancay region, *Santander* (UC). **Cuzco:** Cerro de Colquipata, *Pennell 13736* (F, GH, US). **Puno:** Prov. Sandia, between Sandia and Cuyocuyo, *Ferreira 16753* (GH).

46. ***Grammitis pseudonutans*** (Christ & Rosenst.)
Morton, Contr. U.S. Natl. Herb. 38: 114. 1967.

Polypodium pseudonutans Christ & Rosenst., Repert. Spec. Nov. Regni Veg. 5: 15. 1908. TYPE: Ecuador, Mt. Tungurahua, *Rimbach* (Rosenst. Exsicc. 39) (holotype, n?; isotype, us!).

Ctenopteris pseudonutans (Christ & Rosenst.) Copel., Philipp. J. Sci. 84: 389. 1956.

Plants epiphytic, not or scarcely aromatic. **Stem** 1.5–2.5 mm in diameter, short- or long-creeping, provided with ovate or ovate-lanceolate, thin, iridescent, gray-brown scales, these 5–8 mm long, clathrate, 20–30 cells across at scale base and most lumina small and central ones often nearly isodiametric, scale margins naked. **Leaves** 18–36 cm long, 1.5–4.5 cm broad. **Petiole** 3–6 cm long, sparsely provided with minute (0.1–0.2 mm) simple or branched, pluricellular trichomes, long, spreading unicellular ones lacking. **Lamina** 1-pinnate, chartaceous, narrow-elliptic, gradually tapering at both ends, 5–10 proximal pinnae gradually reduced to mere auricles, rachis and lamina tissue with castaneous, unicellular trichomes to 1 mm long, glabrous adaxially. **Pinnae** 1–3 cm long, 4–8 times longer than broad, narrow- to oblong-deltate, patent or slightly ascending, adnate, acute or subacute, subequilaterally dilated at base, or occasionally subtruncate acroscopically, margins entire and plane. **Veins** simple, 6–12 pairs on a pinna, hydathodes evident. **Sori** 5–9 pairs on a pinna, sporangia glabrous.

In forests or thickets, on tree trunks or branches, 3000–3425 m, San Martín.

Colombia; Ecuador; Peru.

Very similar to this is *G. sodiroi* (Christ & Rosenst.) Morton of Ecuador, whose type was collected by Rimbach at the type location of *G. pseudonutans*. The former differs in the abruptly reduced lamina, the completely glabrous rachis, and the immersed sori.

San Martín: Prov. Mariscal Cáceres, Chochos, Río Abiseo National Park, *León 2132*, in part (UC). Prov. Mariscal Cáceres, Mirador, Río Abiseo National Park, *Young 2154* (USM).

47. ***Grammitis andicola*** Stolze, *sp. nov.*

Caulis 1–1.5 mm crassus, repens. Squamae caulis 4–6 mm longae, fuliginosae, clathratae, margine integra, luminibus 18–25 horizontaliter et pro partem maximam parvis et isodiametris. Folia approximata vel distantia, 12–30 cm longa, 0.6–2.2 cm lata. Lamina 1-pinnata vel pinnatisecta, basis gradatim reductis. Rachis glabra. Segmenta 0.4–1.2 cm longa, oblonga vel oblonge deltata, obtusa vel subacuta, trichomatibus circa 1 mm longis, rigidis, castaneis. Venae simplices, hydathodis evidentibus. Sori 2–5(–7) jugi per segmento. Sporangia glabra.

Plants terrestrial, rarely epiphytic or epipetric, somewhat aromatic. **Stem** 1–1.5 mm in diameter, long-creeping, provided with ovate or broadly lanceolate, thin, iridescent, gray-brown scales, these 4–6 mm long, clathrate, 18–25 cells across at scale base and at least the lumina of central cells small and nearly isodiametric, scale margins naked. **Leaves** approximate to well spaced, 12–30 cm long, 0.6–2.2 cm broad. **Petiole** 3–9 cm long, scarcely to moderately provided with orange to red-brown, spreading, unicellular trichomes to 1 mm long, moderately to amply provided with simple to 1-forked pluricellular trichomes 0.1–0.2 mm long. **Lamina** cut nearly or quite to the rachis, chartaceous to subcoriaceous, linear or narrow-elliptic, tapering at both ends, 5–many proximal pinnae gradually reduced to mere auricles, rachis glabrous, segments amply provided with rigid, castaneous trichomes to 1 mm long, especially among the sori. **Pinnae** 0.4–1.2 cm long, 1.5–2 times as long as broad, patent, adnate, oblong or oblong-deltate, obtuse or subacute, slightly dilated and subequilateral at base, the margins entire and strongly revolute. **Veins** simple, 3–8(–10) pairs on a pinna, hydathodes evident. **Sori** 2–5(–7) pairs on a pinna, sporangia glabrous.

TYPE—Peru, Amazonas, Prov. Chachapoyas, Cerros Calla Calla, *Hutchison & Wright 5826* (holotype, F!; isotypes, GH!, UC!).

In forests or thickets, on the forest floor, or rarely on rock cliffs or low on tree trunks, 2500–4250 m, along the Cordillera Central from Amazonas to Cuzco.

Thus far known from Peru and one specimen from Colombia: Cauca, Parque Nacional de Puracé, *Lozano et al. 4464* (F).

This is very similar to *G. moniliformis* and *G. flabelliformis* in the linear leaves cut nearly or quite to the rachis into many short and broad, obtuse

to subacute pinnae, many of which are as broad as long. Leaves of *G. moniliformis* are approximate to subfasciculate and glabrous, whereas those of *G. andicola* are usually well spaced, and segments and often the petiole are provided with rigid, castaneous, unicellular trichomes. From *G. flabelliformis*, *G. andicola* differs especially in the broader stem scales, cells with lumina about twice as many across at scale base, and those at the middle of the scale mostly isodiametric. Scales of *G. flabelliformis* are larger and mostly elongate throughout. In *G. andicola*, pinnae are usually longer (mostly over 5 mm long) and petioles thicker (mostly over 0.6 mm). Pinnae of *G. flabelliformis* are commonly less than 5 mm long and petioles less than 0.6 mm thick.

Amazonas: Prov. Bagua, Cordillera Colán SE of La Peca (aberrant form), *Barbour 3556* (MO, UC). Prov. Chachapoyas, Cerros Calla Calla, *Hutchison 4754* (GH, UC, in part). Prov. Chachapoyas, slopes of Puma-Urcu ESE of Chachapoyas, *Wurdack 702* (US). **San Martín:** Dist. Huallaga, Valley of Río Apisoncho, *Hamilton & Holligan 1223* (US). Prov. Mariscal Cáceres, NW corner of Río Abiseo National Park, *Young & León 4423* (USM), 4826 (USM). Prov. Mariscal Cáceres, Río Abiseo National Park, Puerta del Monte, *Young 1983* (HUT). **Pasco:** Prov. Oxapampa, Santa Bárbara, *D. Smith 8117* (F, MO). **Cuzco:** Cabecera del Río Korebeni, *Bües 1948* (US), 1955 (US). Prov. La Convención, Huayopata, *Peyton & Peyton 974* (GH, MO).

48. *Grammitis asplenifolia* (L.) Proctor, Brit. Fern Gaz. 9: 76. 1962.

Polypodium asplenifolium L., Sp. pl. 2: 1084. 1753. TYPE: Petiver, Pter. Amer., t. 7, f. 16, from Plumier, Traité foug. Amér., t. 102a, based on a specimen from Martinique.

Polypodium dolorense Hieron., Bot. Jahrb., Syst. 34: 512. 1904. TYPE: Colombia, Prov. Antioquia, Río Dolores, *Lehmann 7380* (holotype, B?; isotype, US!).

Ctenopteris asplenifolia (L.) Copel., Gen. fil. 219. 1947. *Ctenopteris dolorenensis* (Hieron.) Copel., Philipp. J. Sci. 84: 449. 1956.

Plants epiphytic. **Stem** short-creeping or decumbent, provided with abundant, lustrous, orange scales, these not or scarcely clathrate, 1–3 mm long, the margins with whitish or hyaline setae. **Leaves** deeply pinnatisect, 25–60 cm long, 3–7 cm broad. **Petiole** 10–30 cm long, 0.4–1.2 mm in diameter, sparsely to abundantly provided with sericeous, spreading, unicellular trichomes, these 1–3 mm long, tawny to orange. **Lamina** thin-herbaceous, lanceolate, cut nearly to the rachis, gradually reduced to apex, scarcely reduced at base (or

only 1–2 basal pairs of segments strongly reduced), rachis and tissue amply provided with orange or reddish brown, spreading trichomes. **Segments** 1–4 cm long, patent, narrow-deltate, acute, dilated subequally at base, or more strongly decurrent basiscopically, the margins entire and with simple, spreading trichomes. **Veins** simple, but fertile ones with a rudimentary spur on which the sorus is borne, hydathodes dark brown, small but usually distinct. **Sori** inframedial, sporangia with long, pale setae.

On tree trunks in rain forests, 1500–2400 m, Huánuco, Pasco, and Junín.

Mexico and Central America; West Indies; Trinidad; Venezuela; Colombia to Bolivia.

This differs from *G. lehmanniana* (Hieron.) Morton, of Central America and northern South America, in a few subtle characters: the petiole is shorter, the stem scales have longer setae, and the sporangia have 2–3 (vs. 1) setae.

Grammitis chryseri (Copel.) Proctor, of Jamaica, probably should be included with *G. asplenifolia*. The former has been separated on the basis of its larger leaves with forked veins. Veins of *G. asplenifolia* are indeed forked, but the fork is reduced to a short spur on which the sorus is borne. At best, *G. chryseri* should be recognized only as a variety.

Huánuco: Prov. Huánuco, Mirador, on road from Acomayo to Chinchao, *Mexia 4141*, in part (UC). **Pasco:** Prov. Oxapampa, Oxapampa, *van der Werff et al. 8608* (MO, UC). **Junín:** Chanchamayo Valley, *C. Schunke 23* (F, US). Prov. Tarma, Agua Dulce, *Woytkowski 35485* (UC).

49. *Grammitis dependens* (Baker) Morton, Contr. U.S. Natl. Herb. 38: 104. 1967.

Polypodium dependens Baker, in Hooker & Baker, Syn. fil. 335. 1867. TYPE: Ecuador, Mt. Pichincha, *Spruce 5637* (as 563) (holotype, K!; photos, F, US).

Plants epiphytic. **Stem** small, suberect, sparsely provided with minute, deltate, sublustrous, castaneous scales, these 1 mm long, nonclathrate, the margins with rigid, whitish setae. **Leaves** 12–30 cm long, 1–1.5 cm broad. **Petiole** 1 cm long or less, 0.2–0.4 mm in diameter, amply provided with spreading, yellowish, unicellular trichomes to 1.5 mm long. **Lamina** thin-herbaceous, linear, 1-pinnate, strongly and gradually reduced to apex and base, pilose as on the petiole, but also inter-

mixed with stouter, castaneous, sessile-stellate trichomes. **Pinnæ** 0.4–1 cm long, oblong-elliptic, obtuse at apex, somewhat narrowed at base, the margins entire and the trichomes mostly in fascicles of 2 or 3. **Veins** 1–2 pairs in each pinna, hydathodes small, brown, sometimes obscured by the indument. **Sori** several to a pinna, sporangia each with 1 long seta.

On tree trunks in wet forests, 3000–3100 m, Cuzco.

Colombia to Peru.

Copeland (1956) combined this with *G. heteromorpha*, suggesting that it is merely an unbranched form of the latter. The supposition may be correct, for the two taxa are remarkably similar in such critical features as stem scales and lamina indument. However, pending monographic revision, *G. dependens* is separated here by the unbranched leaves and the oblong-elliptic (vs. obovate) pinnæ.

Cuzco: Michihuañunca, *Bües* 731 (us). Huadquina, *Bües* 975 (us).

50. **Grammitis heteromorpha** (Hooker & Grev.) Morton, Contr. U.S. Natl. Herb. 38: 102. 1967.

Polypodium heteromorphum Hooker & Grev., Icon. fil. 1, t. 108. 1829. TYPE: Ecuador, Prov. Pichincha, between Mt. Chimborazo and Pichincha, *Jameson* (holotype, K!; isotype, FI; photos, F of K, US of FI).

Ctenopteris heteromorpha (Hooker & Grev.) Copel., Philipp. J. Sci. 84: 412. 1956.

Plants terrestrial (in Peru), epiphytic, or epipetric. **Stem** small, short-creeping or decumbent, provided with ovate or deltate, nonclathrate scales, these 0.5–1.5 mm long, lustrous, castaneous, the margins with rigid, whitish setae. **Leaves** lax, swollen and articulate at the stem, crowded to subfasciculate, 1-pinnate and 1–2-forked, to 60 cm long and 8 cm broad. **Petiole** 1–5 cm long, 0.2–0.4 mm in diameter, amply provided with thin, spreading trichomes, these tawny to orange, 1–2 mm long and often intermixed with a few pluricellular, simple or branched trichomes about 0.2 mm long. **Lamina** thin- to firm-herbaceous, indeterminate, reduced at base. **Rachis** brown to blackish, indument as on the petiole, except occasionally some long, castaneous, stellate trichomes intermixed with the simple, light-colored ones. **Pinnæ** sessile, 4–7 mm long, 2–4 mm broad, obovate or spatulate, amply pilose as on the rachis. **Veins** distinct to obscure, pinnately branched in each pinna and the

branches terminating in hydathodes adaxially, the latter (outside Peru) sometimes covered by calcareous deposits. **Sori** round, 3–5 per segment, sporangia (in Peru) glabrous.

On shaded, rocky slopes, among boulders (but often epiphytic outside Peru), 4400–4500 m, Ancash.

Mexico; Guatemala; Colombia to Bolivia.

This is a variable species that may include some distinct forms or varieties. Plants in Mexico and Guatemala are thinner in texture and sometimes bear white deposits on the hydathodes. Some specimens from Colombia have larger, oblong pinnæ nearly 1 cm long, with white hydathodes and setose sporangia. Copeland (1956) included with this *G. dependens* and *G. variabilis*; see treatment of the latter for detailed discussion of taxonomy and typification. The entire complex needs monographic revision.

Ancash: Prov. Huaráz, Huascarán National Park, Quebrada Llaca, *D. Smith et al.* 8987 (F, MO). Prov. Huaráz, Huascarán National Park, Quebrada Ishinca, *D. Smith et al.* 9544 (F, HUT, MO).

51. **Grammitis lanigera** (Desv.) Morton, Contr. U.S. Natl. Herb. 38: 105. 1967.

Plants epiphytic, rarely terrestrial in var. *lanigera*. **Stem** suberect, provided with ligulate to narrow-deltate, lustrous, castaneous scales, these 1–3 mm long, nonclathrate, the margins with rigid orange to hyaline setae. **Leaves** indeterminate, pendulous, 25–70 cm long, 2.5–8 cm broad. **Petiole** 0.5–4 cm long, 0.4–1 mm in diameter, copiously provided with spreading, sericeous, yellowish or hyaline trichomes to 2 mm long. **Lamina** firm-herbaceous to chartaceous, narrow-elliptic, 1-pinnate, strongly reduced at apex and base, densely and simply pilose as on the petiole (often nearly obscuring the lamina surface), but also with abundant sessile-stellate trichomes, these (in var. *stella*) stouter and castaneous. **Pinnæ** commonly 20–50 pairs, 4–10 pairs along 5 cm of rachis, 1.1–4.5 cm long, 0.4–1.2 cm broad, patent to slightly ascending, broadly to narrowly deltate, apex acute or subacute, subequilateral at base, there truncate to slightly dilated acroscopically, rather strongly dilated basiscopically, the margins entire and with trichomes simple to sessile-stellate. **Veins** obscure, simple, hydathodes brown or occasionally with circular white deposits, often completely obscured by the dense indument. **Sori** 6–12 pairs on a pinna, sporangia with 1–3 long setae.

The species occurs in Costa Rica, Hispaniola, the Lesser Antilles, and from Colombia to Bolivia.

This is part of the confusing species complex involving *G. cultrata* (Willd.) Proctor, *G. dependens*, *G. heteromorpha*, *G. laxa*, *G. subflabelliformis*, and probably a few more taxa outside Peru. Diagnostic features of many of these are highly variable and species lines are not clearly drawn. The entire group is in need of monographic revision. From the other species in the complex, *G. lanigera* can best be distinguished by the type and

density of lamina trichomes. All the species have long, pale, spreading, sericeous trichomes, and most have these on the margins as well as some in fascicles of 2–4. Other species have a few fascicled trichomes along the rachis with up to 6–7 arms (in the keys and descriptions these are called “sessile-stellate”). However, *G. lanigera* is the only species that has these sessile-stellate trichomes in such dense masses as to often obscure the abaxial laminar surface. It is separated here into two varieties.

Key to Varieties

- a. Sessile-stellate trichomes on lamina sericeous and yellowish to hyaline (occasionally pale orange) 51a. var. **lanigera**
- a. Sessile-stellate trichomes on rachis (and often the laminar surface) rigid and castaneous 51b. var. **stella**

51a. *Grammitis lanigera* var. *lanigera*.

Polypodium lanigerum Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamten Naturk. 5: 316. 1811. TYPE: Peru, *Dombey*, Herb. Jussieu 1099 (holotype, P; isotype, P!; photos, F, GH, US).

Polypodium sericeolanatum Hooker, Sp. fil. 4: 221. 1864. LECTOTYPE (designated by Morton, Contr. U.S. Natl. Herb. 38: 105. 1967): Ecuador, Ravines of Pichincha, *Jameson* 235 (K; frag., US).

Ctenopteris lanigera (Desv.) Copel., Philipp. J. Sci. 84: 420. 1956.

Ctenopteris sericeolanata (Hooker) Copel., Philipp. J. Sci. 84: 453. 1956.

Grammitis sericeolanata (Hooker) Proctor, Rhodora 63: 35. 1961.

In wet forests, pendent from trunks and branches of trees, rarely on wet, moss-covered banks or boulders, 2200–3900 m, Central Peru, from Amazonas to Cuzco.

Hispaniola; Martinique; Costa Rica to Bolivia; possibly Venezuela.

Amazonas: Prov. Chachapoyas, Calla Calla slopes near km 415–418 of Leimebamba–Balsas road, *Wurdack* 1742 (F, GH, UC, US, USM). **San Martín:** Prov. Mariscal Cáceres, NW corner of Río Abiseo National Park, *Young & León* 4604 (USM). **Huánuco:** Muña, trail to Tambo de Vaca, *Macbride* 4303 (F, GH, US). **Pasco:** Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al.* 8464 (MO, US). **Cuzco:** Montaña de Calca, Valle de Lares, *Bües* 1930 (US).

51b. *Grammitis lanigera* var. *stella* (Copel.) Morton, Contr. U.S. Natl. Herb. 38: 106. 1967.

Ctenopteris stella (Copel., Philipp. J. Sci. 84: 452. 1956. TYPE: Peru, Cuzco, Valley of Río Urubamba, *Bües* A32 (holotype, US!).

In wet forests and wooded ravines, (1600–)2400–3740 m, Central Peru, Amazonas to Cuzco.

Colombia to Bolivia.

The distinctive feature of rigid, castaneous, sessile-stellate trichomes on the lamina is shared by only one other species in the *G. cultrata* complex, *G. dependens*. Variety *stella* is normally epiphytic at higher elevations in Peru, usually above 2500 m. However, the *Woytkowski* specimen cited from Amazonas was found at 1600 m on a rocky slope. The lamina pubescence is especially dense, the pinnae are large (to 4 cm long and 1.2 cm broad) and very crowded, and the hydathodes are white-encrusted. (These calcareous deposits are infrequent in the species.) This is certainly an aberrant specimen, and perhaps its unusual features are merely products of the different elevation and habitat.

Amazonas: Mendoza, *Woytkowski* 8254 (MO). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *León* 1908 (UC), *Young & León* 4723 (USM), *Young & León* 4816 (USM). **Huánuco:** Huánuco–Tingo Maria road near Carpish Divide, *Gentry & Smith* 44857, in part (MO). **Pasco:** Prov. Oxapampa, Río San Alberto Valley E of Oxapampa, *D. Smith & Pretel* 7976 (F, MO, USM). **Cuzco:** Huadquina, *Bües* 967 (US), 1007 (US).

52. *Grammitis subflabelliformis* (Rosenst.) Morton, Contr. U.S. Natl. Herb. 38: 104. 1967.

Polypodium subflabelliforme Rosenst., Repert. Spec.

Nov. Regni Veg. 7: 306. 1909. TYPE: Ecuador, Mt. Abitagua, *Spruce 5271* (holotype, K; isotypes, NY!, US).

Polypodium subflabelliforme var. *minor* Rosenst., Repert. Spec. Nov. Regni Veg. 7: 307. 1909. TYPE: Ecuador, Mt. Tungurahua, *Spruce 5272* (holotype, K).

Polypodium senile var. *minor* Rosenst., Meded. Rijks-Herb. 19: 19. 1913. TYPE: Bolivia, Yungas de San Mateo, *Herzog 1985* (holotype, L; isotype, US!).

Ctenopteris subflabelliformis (Rosenst.) Copel., Philipp. J. Sci. 84: 400. 1956.

Plants epiphytic, epipetric or terrestrial. **Stem** small, suberect, sparsely provided with minute, ligulate to oblong, sublustrous, deep orange scales, these 0.5–0.8 mm long, nonclathrate, the margins with whitish or hyaline setae. **Leaves** 7–20 cm long, 0.7–1.2 cm broad. **Petiole** to 1 cm long, 0.1–0.2 mm in diameter, provided with spreading, whitish or yellowish, unicellular trichomes to 1.5 mm long. **Lamina** thin-herbaceous, linear, 1-pinnate, strongly reduced at apex and base, thin-pilose as on the petiole. **Pinnae** 15–35 pairs, 3–6 mm long, 2–3 mm broad, obovate or (occasionally) oblong, obtuse at apex, rounded acroscopically to a very narrow base, often strongly decurrent basiscopically, the margins entire (or slightly gibbous acroscopically) the long, marginal trichomes simple or paired from the base. **Veins** evident, simple to pinnate with 2 pairs of veinlets, hydathodes evident. **Sori** several to a pinna, sporangia with 2–3 long setae.

In wet forests, on tree trunks, humus, or rocky cliffs, 1800–2800 m, Amazonas, Huánuco, Pasco, and Cuzco.

Panama; Ecuador to Bolivia.

Perhaps this should be combined with *G. senilis* (Fée) Morton var. *senilis*, which supposedly differs only in its slightly longer, more oblong pinnae. (The type of the latter was not located for this study, so a comparison could not be made.)

Based on specimens examined, the distribution in Peru (as well as through the entire range) appears to be rather disjunct. However, since this is a very inconspicuous fern, it can be easily overlooked, and it is likely future collecting efforts will prove it to be much more widely distributed.

Amazonas: Prov. Bongará, road to La Rioja, 5 km N of Lake Pomacocha, *Hutchison & Wright 6805* (UC). **Huánuco:** Vilcabamba, hacienda on Río Chinchao, *Bryan 730* (F). **Pasco:** Prov. Oxapampa, Dist. Oxapampa, from Oxapampa to Villa Rica, *León 661* (USM). **Cuzco:**

Valle de Lares, above Río Lachac, *Bües 1812* (US). Prov. La Convención, 10 km SW of Incatambo, *Peyton & King 1433* (MO). Prov. Urubamba, Wiñawaina, *Vargas 22373* (GH).

53. *Grammitis laxa* (Presl) Morton, Contr. U.S. Natl. Herb. 38: 105. 1967.

Polypodium laxum Presl, Reliq. haenk. 1: 23, t. 4, f. 1. 1825. TYPE: "In vallibus cordillerum Peruviae," *Haenke* (holotype, PRC!; isotype, PR!).

Ctenopteris contacta Copel., Philipp. J. Sci. 84: 447. 1956. TYPE: Bolivia, Yungas, *Bang 483* (holotype, US!; isotype, F!).

Plants epiphytic or occasionally terrestrial. **Stem** suberect, sparsely provided with ligulate to narrow-deltate, sublustrous, deep orange to castaneous scales, these 0.5–1.5 mm long, nonclathrate, the margins with rigid, whitish or hyaline setae. **Leaves** 14–40 cm long, 1–4 cm broad. **Petiole** 1 cm long or less, 0.2–0.3 mm in diameter, provided with spreading, sericeous, whitish or hyaline, unicellular trichomes to 2 mm long. **Lamina** thin-to firm-herbaceous, narrow-elliptic, 1-pinnate, pectinate, strongly reduced at apex and base, sparsely to moderately sericeous-pilose as on the petiole. **Pinnae** patent, commonly 60–80 pairs, very crowded (12–20 pairs along 5 cm of rachis), 1–2.5 cm long, 2–3 mm broad, linear, obtuse at apex, broadly adnate and subequilateral at base, there truncate to slightly rounded acroscopically, truncate to slightly dilated basiscopically, the margins entire and subparallel most of their length, the long, marginal trichomes simple, paired or in fascicles of 3. **Veins** indistinct or obscure, simple, hydathodes evident. **Sori** 6–12 pairs on a pinna, sporangia with 1–3 long setae.

In wet forests, on tree trunks or moist, shaded bluffs, 1500–2400 m, Amazonas, Huánuco, and Cuzco.

Ecuador to Bolivia.

It is interesting that Copeland (1956, pp. 420–421) combined *G. laxa* with *G. lanigera*, and in so doing he cited *Bang 483* from Bolivia as a typical example. Yet on page 427 he cited this same collection as type of his new *Ctenopteris contacta* (= *G. laxa*), placed in another group. This is typical of the confusion in the complex of *Grammitis* species with sericeous trichomes and setose sporangia, because the other characters separating these species are rather subtle. For further discussion see treatment of *G. lanigera*.

Amazonas: Prov. Bagua, Cordillera Colán SE of La Peca, *Barbour 3601* (F, MO, USM). **Huánuco:** Pampayacu, *Kanehira 122* (GH, US). **Cuzco:** Trail from Machu Picchu ruins to Inca Bridge, *Bishop 2509, 2510* (both UC). Prov. La Convención, Valle San Miguel, *Bües 2130* (US). **Department unknown:** *Poeppig 170* (P), *Poeppig* in 1829 (MO).

54. **Grammitis cultrata** (Willd.) Proctor, *Rhodora* 63: 35. 1961.

Polypodium cultratum Willd., Sp. pl. ed. 4, 5: 187. 1810. TYPE: Jamaica, *Swartz* (holotype, B, Herb. Willd. 19674; photos, GH, US).

Ctenopteris cultrata (Willd.) Copel., Gen. fil. 219. 1947.

Plants epiphytic. **Stem** erect, sparsely provided with ligulate to narrow-deltate, sublustrous, castaneous or deep orange scales, these 0.5–2 mm long, nonclathrate, the margins with rigid, orange or hyaline setae. **Leaves** pendulous, 30–50 cm long, 1.5–5 cm broad. **Petiole** 0.5–3 cm long, 0.2–0.3 mm in diameter, amply provided with spreading, sericeous, yellowish or hyaline trichomes to 2 mm long. **Lamina** thin- to firm-herbaceous, narrow-elliptic, 1-pinnate, strongly reduced at apex and base, sparsely to moderately pilose as on the petiole, and with scattered sessile-stellate ones on the rachis. **Pinnae** commonly 20–50 pairs, 5–10 pairs along 5 cm of rachis, 1–2 (–2.5) cm long, (0.3–)0.4–1.2 cm broad, patent or often somewhat deflexed, broadly to narrowly deltate, apex obtuse to acute, mostly subequilateral at base, there slightly rounded or dilated acroscopically, usually obviously dilated basiscopically, the margins entire and with trichomes simple, paired, or in fascicles of 3. **Veins** indistinct or obscure, simple, hydathodes evident. **Sori** 4–8 pairs on a pinna, sporangia with 1–3 long setae.

In dense forests or thickets, on trunks or high branches of trees, 1100–3100 m, in central Peru from Amazonas to Puno.

Southern Mexico to Panama; Greater Antilles, Colombia and Venezuela to Bolivia and Brazil.

Pinna shape varies widely in this species, and monographic study may reveal that there are several varieties or forms. In the Greater Antilles pinnae are patent, small, obtuse, nearly oblong, with a somewhat equilateral base, i.e., rounded acroscopically and dilated basiscopically (approaching pinna shape of *G. subflabelliformis*). Most specimens from Peru and Bolivia have deltate, acute or subacute pinnae, many of them somewhat re-

flexed, with bases subequilateral, i.e., slightly rounded or dilated on each side. In Central America and northern South America, both shapes seem to be rather equally common. The most extreme form is represented by the type (K) of *Polypodium alternifolium* Hooker (= *P. longum* C. Chr.) from Ecuador, with acute, broadly deltate, subequilateral pinnae to 3 cm long and 1 cm broad. This specimen resembles larger specimens of *G. lanigera* and seems to be intermediate between the two species.

The entire species group of *G. cultrata* is greatly in need of revision. For further discussion of problems in this complex, along with a list of some of the other species, see treatment of *G. lanigera*.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla, 19 km above Leimebamba, *Hutchison & Wright 5582* (GH, UC). **San Martín:** Prov. Rioja, Venceremos, *D. Smith 4472* (F, MO, UC). **Huánuco:** Prov. Huánuco, Mirador, road from Acomayo to Chinchao, *Mexia 4141* (GH, MO, UC in part). **Junín:** Carpapata, above Huacapistana, *Killip & Smith 24458* (F, NY, US). Pichis Trail, San Nicolás, *Killip & Smith 25988* (F, NY, US). **Pasco:** Prov. Oxapampa, surroundings of Oxapampa, *van der Werff et al. 8349* (MO, UC). **Cuzco:** Cerro Chuyapí, *Bües 443* (US), *A47*, (US). **Puno:** Near San Gabán (as Gavan), *Lechler 2166* (GH).

55. **Grammitis blepharolepis** (C. Chr.) Morton, Contr. U.S. Natl. Herb. 38: 98. 1967.

Polypodium gracillimum Hieron., Hedwigia 48: 250, t. 12, f. 18. 1909, not Copel. 1905. TYPE: Ecuador, Quito to Mindo, *Stübel 747* (holotype, B).

Polypodium blepharolepis C. Chr., Index fil. suppl. 1: 58. 1913, nom. nov. for *P. gracillimum* Hieron. and with the same type.

Xiphopteris blepharolepis (C. Chr.) Copel., Amer. Fern J. 42: 109. 1952.

Plants epiphytic. **Stem** small, suberect, provided with lanceolate or ovate, lustrous, deep orange or reddish brown scales, these 1–2 mm long, subclathrate, the margins with long, rigid, concolorous setae. **Leaves** 5–15 cm long, 0.4–0.7 cm broad. **Petiole** 0.5–1.5 cm long, 0.3–0.4 mm in diameter, abundantly provided with spreading, rigid, reddish brown, unicellular trichomes about 1 mm long. **Lamina** chartaceous, linear, divided nearly or quite to the rachis into numerous, crowded segments, abruptly reduced at apex and base, pilose as on the petiole. **Segments** 2–3 mm long, oblong or oblong-elliptic, the apex obtuse, the base truncate or somewhat dilated, the margins entire, often gibbous near the acroscopic base. **Veins** obscure,

simple in each segment, or with one short acroscopic branch, hydathodes evident. **Sori** solitary and at or near the base in each segment, sporangia glabrous.

In forests on tree trunks, 300–1400 m, Pasco, Junín, and Puno.

Venezuela; Colombia to Peru.

With this probably should be included *Grammitis basalis* (Morton) Lell. (Ecuador) and *G. daguensis* (Hieron.) Morton (Colombia). The former seems to be identical. The latter was distinguished by Morton (1967) solely on the basis of its non-gibbous segments; however, an isotype (B!) has gibbous and nongibbous segments alike, and no other different features were noted.

Pasco: Prov. Oxapampa, Pichis Valley, San Matías Ridge, *Foster 8616* (F, MO), *León 315* (USM). **Junín:** Schunke Hacienda above San Ramón, *Killip & Smith 24648* (US), *C. Schunke A157* (US). La Merced, Hacienda Schunke, *Macbride 5639* (F, US). **Puno:** La Pampa, Río Távara, *Watkins 1916* (US).

56. *Grammitis truncicola* (Klotzsch) Morton, Contr. U.S. Natl. Herb. 38: 98. 1967.

Polypodium truncicola Klotzsch, Linnaea 20: 374. 1847. TYPE: Venezuela, Colonia Tovar, *Moritz 252* (isotype, US).

Polypodium andinum Hooker, Sec. cent. ferns, t. 6. 1847. LECTOTYPE (designated by Morton, Contr. U.S. Natl. Herb. 38: 98. 1967): Ecuador, Banks of Río Hondacha, *Jameson 780* (K).

Grammitis andina (Hooker) Ching, Bull. Fan. Mem. Inst. Biol., Bot. 10: 240. 1941.

Xiphopteris truncicola (Klotzsch) Copel., Amer. Fern J. 42: 101. 1952.

Plants epiphytic. **Stem** small, suberect, provided with lanceolate or ovate, lustrous, deep orange or reddish brown scales, these 1–2 mm long, sub-clathrate, the margins with rigid, concolorous setae. **Leaves** 5–10 cm long, 0.6–1 cm broad. **Petiole** obsolete or nearly so, abundantly provided with spreading, rigid, reddish brown, unicellular trichomes to 1 mm long. **Lamina** thin- to firm-herbaceous, linear to narrow-elliptic, pinnatisect, reduced at apex and base, pilose as on the petiole. **Segments** 2–3 mm long, broadly oblong or oblong-elliptic, the apex obtuse, the margins entire. **Veins** obscure, simple in each segment, or with a short, acroscopic branch, hydathodes evident. **Sori** solitary and borne at or near the base in each segment, sporangia glabrous.

Thus far known in Peru only from San Martín. The collection represents one of the syntypes of *Polypodium andinum*.

Costa Rica; Venezuela; Colombia to Peru.

This scarcely differs from *G. blepharolepis*. Monographic study is needed.

San Martín: Mount Picote, near Moyobamba, *Nelson (Spruce 4780)* (K).

57. *Grammitis david-smithii* Stolze, sp. nov. **Figures 5d–f.**

Caulis erectus, paleis 2–4 mm longis, lineari-deltatis, attenuatis, fuliginosis, clathratis, setosis. **Folia** 12–35 cm longa, 2–5 cm lata, pectinata, 1-pinnata vel pinnatisecta. **Petiolus** 1–8 cm longus, (0.4–)0.5–1.2 mm latus, trichomatibus sparsis vel abundantibus, 0.4–0.9 mm longis, unicellularibus, aurantiacis vel rubiginosis. **Segmenta** 0.9–2.8 cm longa, 0.2–0.4 cm lata, linearia vel lineari-deltata, glabra vel hirsuta. **Venae** simplices, 6–14 jugae. **Hydathodi** brunneae.

Plants epiphytic, rarely epipetric. **Stem** erect, provided with linear-deltate, attenuate, iridescent gray-brown scales, these 2–4 mm long, essentially clathrate, the margins with rigid orange or reddish brown setae. **Leaves** 12–35 cm long, 2–5 cm broad. **Petiole** 1–8 cm long, (0.4–)0.5–1.2 mm in diameter, sparsely to amply provided with rigid, orange or reddish brown trichomes 0.4–0.9 mm long. **Lamina** chartaceous, elliptic, pectinate, divided nearly or quite to the rachis, apex gradually reduced, the base abruptly reduced, the rachis amply hirsute like the petiole, but trichomes shorter (0.3–0.5 mm), surface glabrous adaxially, moderately hirsute or glabrescent abaxially. **Segments** 0.9–2.8 cm long, 0.2–0.4 cm broad beyond the dilated base, linear or linear-deltate, subacute, the margins entire, usually host to clavate, black fungi (Ascomycetes) on the abaxial surface. **Veins** simple, distinct or indistinct, 6–14 pairs in each segment, hydathodes distinct but lacking white encrustations. **Sori** medial to supramedial, 6–12 pairs on a segment, sporangia glabrous.

TYPE—Peru, Prov. Oxapampa, 2–4 km N of Mallampampa, *D. Smith & Canne 5837* (holotype, F!; isotype, MO!).

In forests, on tree trunks and branches, rarely on mossy boulders, 1800–2800 m, Huánuco, Pasco, Junín, and Cuzco.

Peru and Bolivia.

This is another of the species with setose scales very closely related to *G. semihirsuta* (under which may be seen further discussion), but the only one in Peru with scales iridescent, gray-brown, and clathrate; i.e., the cell walls are relatively thin, with lumina transparent (although often quite narrow). Scales of the other species in the complex are black, orange, or reddish brown and have thick, crowded cell walls and the lumina occluded.

The species is named in honor of the late David N. Smith, a friend and indefatigable collector of Andean plants who had an especially keen eye for ferns. His excellent collections are well represented throughout this flora.

Huánuco: Huánuco-Tingo María road near Carpath Divide, *Gentry & Smith 44857*, in part (MO). **Pasco:** Prov. Oxapampa, San Alberto, Cordillera de Yanachaga, *van der Werff et al. 8451* (MO, UC), *8452* (MO, UC). **Junín:** Prov. Chanchamayo, Río Rundayacu, 45 km from San Ramón, *D. Smith et al. 2607* (MO). **Cuzco:** Machu Picchu, trail to Wiñay Waina, *Bishop 2506* (UC). Huadquiña, *Bües 1252* (US). Valle de Lares, *Bües 1929* (US).

Additional paratypes follow.

Ecuador: Prov. Pichincha, Páramo de Guamaní, road from Pifo to Papallacta, just west of the pass, 4000 m, *Stolze & Stolze 1663* (F). **Bolivia:** Cochabamba, Prov. Chapare, Cochabamba, *Beck 1424a* (F). **La Paz:** Prov. Nor Yungas, Chuspipata, *Beck 7600* (F).

58. *Grammitis pichinchensis* (Hieron.) Morton, Contr. U.S. Natl. Herb. 38: 111. 1967.

Polypodium subscabrum sensu Hooker, Sp. fil. 4: 183, t. 274A. 1864 (based on *Moritz 332, κ*), not Klotzsch, 1847 (based on *Moritz 332, B*).

Polypodium pichinchense Hieron., Bot. Jahrb. Syst. 34: 506. 1904. LECTOTYPE (designated by Morton, 1967): Ecuador, western side of Pichincha, *Jameson* in 1862 (B!, photo, F; probable islectotypes, B!, BM!, US).

Polypodium ecuadorensis C. Chr., Index fil. 524. 1906. *Nom. superfl.*, an illegitimate renaming of *P. pichinchense* Hieron. 1904.

Ctenopteris ecuadorensis (C. Chr.) Copel., Philipp. J. Sci. 84: 434. 1956.

Plants epiphytic, rarely (in Ecuador) epipetric. **Stem** suberect, provided with lanceolate or narrow-deltate, attenuate, lustrous, blackish scales, these 1–3 mm long, nonclathrate, the margins with dark, rigid setae. **Leaves** 10–20 cm long, 0.7–2 cm broad. **Petiole** 1–4 cm long, 0.3–0.6 mm in di-

ameter, abundantly provided with spreading, rigid, castaneous, unicellular trichomes 1–2 mm long. **Lamina** firm-herbaceous to chartaceous, narrow-elliptic, deeply pinnatisect nearly to rachis, gradually reduced to apex and base, rachis and at least the abaxial surface sparsely to moderately pilose as on the petiole. **Segments** 0.3–1 cm long, 0.15–0.25 cm broad at base, deltate or oblong-deltate, obtuse or subacute, the margins entire, usually host to clavate, black fungi (Ascomycetes) on the abaxial surface. **Veins** simple, indistinct or obscure, 3–4 pairs in each segment, hydathodes distinct and each usually encrusted with a calcareous deposit. **Sori** medial to inframedial, 2–4 pairs per segment, sporangia glabrous.

In forests on tree trunks, rarely (in Ecuador) in rock crevices, known thus far in Peru by a single specimen, 2600 m, Huánuco.

Ecuador; Peru.

Nomenclature has been badly confused and application of the name incorrectly applied because of a spurious type collection of *Polypodium subscabrum* Klotzsch, *Moritz 332* (Venezuela). Apparently a label of the latter was inadvertently affixed to an Ecuadorean specimen (κ) of what is now recognized as *Grammitis pichinchensis*. Hooker (1862), unaware of a true isotype of *P. subscabrum* (BM), applied this name to the specimen he thought was type material at Kew. He was followed by subsequent authors, including Morton (1967), who made the combination of *Grammitis subscabra*. *Polypodium subscabrum* Klotzsch is a true *Polypodium*, not *Grammitis*, and is likely confined to Venezuela.

Further confusion resulted when *Polypodium pichinchense* Hieron. was published. Despite its similar name, *Polypodium pichincae* Sodiro (*Grammitis pichincae* (Sodiro) Morton) is a different species. *Grammitis pichincae* (Ecuador) has leaves up to twice as long and broad, pinnae mostly acute, and glabrous adaxially, and hydathodes lacking white deposits. For full clarification of nomenclature and correct application of names, see Stolze (Amer. Fern J. 81: 139–140. 1991).

Huánuco: Cani, 7 mi NE of Mito, *Bryan 383* (F).

59. *Grammitis alsopteris* Morton, Contr. U.S. Natl. Herb. 38: 112. 1967. TYPE: Ecuador, Napo-Pastaza, Canton Mera, *Mexia 7013* (holotype, US!; photo, F).

Plants epiphytic, very rarely epipetric. **Stem** erect, provided with deltate or linear-deltate, lustrous orange or reddish brown scales, these 2–4 mm long, not or scarcely clathrate, the margins and apex with hyaline setae. **Leaves** 15–45 cm long, (3.5–)4–10(–12) cm broad. **Petiole** 7–16 cm long, 0.8–1.5 mm in diameter, amply provided with pale to deep orange, spreading, unicellular trichomes to 2 mm long. **Lamina** chartaceous, deltate or lanceolate-deltate, pectinate, 1-pinnate, gradually reduced to apex, base not or scarcely reduced, proximal pinnae as long as the rest, or 1–3 pairs of them slightly reduced, the rachis trichomes 0.4–0.7 mm long abaxially, 0.2–0.3 mm long adaxially, surface amply but minutely castaneous-puberulent abaxially, glabrous adaxially. **Pinnae** 2–6 cm long, 0.2–0.5 cm broad beyond the dilated base, 6–15 times as long as broad, linear or linear-deltate, apex acute or subacute, adnate, usually host to clavate, black fungi on the abaxial surface, margins entire. **Veins** simple, 10–26 pairs on a pinna, hydathodes distinct and commonly encrusted with calcareous deposits. **Sori** supramedial to submarginal, sporangia glabrous.

In rain forests, on tree trunks, or, very rarely, on wet, moss-covered rocks, 2300–2850 m, Pasco and Cuzco.

Costa Rica; Panama; Colombia to Peru.

The species occurs at lower elevations (900–2100 m) in Colombia and Ecuador. It is easily distinguished from most of the related taxa by the minute, rigid (0.1 mm), castaneous trichomes on the abaxial laminar surface, while the others have glabrous surfaces. *Grammitis taxifolia* has pale, usually longer trichomes on the abaxial pinna surface, but the lamina is conspicuously reduced at base, and the margins of the stem scales are naked, not setose. Hieronymus described two varieties of *G. semihirsuta* from Colombia: *Polypodium semihirsutum* var. *fuscetosum* and var. *hirtopuberulum*. Both these varieties supposedly have longer, spreading trichomes on the pinnae.

Pasco: Prov. Oxapampa, Mallampampa, *D. Smith & Canne 5800*, in part (MO, UC). **Cuzco:** Trail from Machu Picchu to Wiñay Waina, *Bishop 2507* (UC). Prov. Uru-bamba, Machu Picchu, trail to Intipata, *León 2107* (F).

60. *Grammitis leucosticta* (John Sm.) Morton, Contr. U.S. Natl. Herb. 38: 112. 1967.

Polypodium leucosticton Fée, (Mém. foug. 5) Gen. fil. 240. 1852, not Klotzsch, 1847. TYPE: Ecuador,

Quito, *Jameson* (holotype, P?; isotype, usl, photo, F of us).

Ctenopteris leucosticta John Sm., Hist. fil. 185. 1875. Type same as for *P. leucosticton* Fée.

Polypodium longiusculum C. Chr., Index fil. 541. 1906.

Ctenopteris longiuscula (C. Chr.) Copel., Philipp. J. Sci. 84: 456. 1956, nom. superfl. for *C. leucosticta* John Sm.

Plants epiphytic, very rarely terrestrial. **Stem** erect, provided with narrow-deltate, lustrous, deep orange to castaneous scales, these 2–4 mm long, not or scarcely clathrate, the margins with concolorous setae. **Leaves** 25–60 cm long, 2.5–4 cm broad. **Petiole** 6–16 cm long, 0.8–1.2 mm in diameter, amply provided with deep orange to castaneous, spreading, unicellular trichomes to 2 mm long. **Lamina** chartaceous, narrow-elliptic or oblong-elliptic, 1-pinnate, gradually reduced to apex and base, the rachis trichomes 1–2 mm long (at least proximally), sometimes partially broken off on dried specimens, surfaces glabrous, although costae adaxially often with a few, long, deciduous trichomes. **Pinnae** 1.2–2 cm long, 0.3–0.45 cm broad beyond the often broadened base, 4.5–6 times as long as broad, deltate or oblong-deltate, obtuse to subacute, adnate, usually host to clavate, black fungi on the abaxial surface, margins entire. **Veins** simple, 6–17 pairs on a pinna, hydathodes distinct and commonly encrusted with calcareous deposits. **Sori** supramedial or submarginal, sporangia glabrous.

In wet forests, on tree trunks or rarely on the forest floor, 1900–3100 m, Amazonas and Pasco.

Ecuador; Peru.

The most obvious distinction between this and its nearest relatives, *G. semihirsuta* and *G. alsop-teris*, is the shorter and broader, usually obtuse, pinnae. The lamina of the other two species is pectinate, with crowded, linear or linear-deltate, usually acute pinnae.

Amazonas: Prov. Bagua, Cordillera Colán SE of La Peca, *Barbour 4137, 4177* (both MO). Prov. Chachapoyas, Cerros Calla Calla above Balsas, *Hutchison & Wright 5827* (F, GH, UC). 40 mi E of Chachapoyas, *Osgood & Anderson 51* (F, US). **Pasco:** Prov. Oxapampa, 4–5 km N of Mallampampa, *D. Smith & Canne 5800*, in part (MO, UC).

61. *Grammitis semihirsuta* (Klotzsch) Morton, Contr. U.S. Natl. Herb. 38: 113. 1967.

Polypodium semihirsutum Klotzsch, Linnaea 20: 379.

1847. TYPE: Peru, Ruiz 9 (holotype, B?; isotype, US!, photo, F of US).

Ctenopteris semihirsuta (Klotzsch) Copel., Philipp. J. Sci. 84: 450. 1956.

Plants epiphytic. **Stem** erect, provided with narrow-deltate, lustrous, castaneous scales, these 2–3 mm long, nonclathrate, the margins with orange or castaneous setae. **Leaves** 15–50 cm long, 3.5–8 cm broad. **Petiole** 5–14 cm long, 0.8–1.5 mm in diameter, sparsely to amply provided with deep orange to castaneous, spreading, unicellular trichomes to 2 mm long. **Lamina** firm-herbaceous to chartaceous, lanceolate or elliptic, 1-pinnate, gradually reduced to apex and base, the rachis trichomes scattered to ample, to 1 mm long abaxially often with a few long, deciduous trichomes. **Pinnae** 1.2–3.5 cm long, 0.3–0.5 cm broad beyond the often dilated base, 7–9 times as long as broad, linear-deltate, acute, adnate, usually host to clavate, black fungi on the abaxial surface, margins entire. **Veins** simple, 16–24 pairs on a pinna, hydathodes distinct and often encrusted with calcareous deposits. **Sori** supramedial or submarginal, sporangia glabrous.

In wet forests, on tree trunks, 2450–3100 m, Amazonas, San Martín, and Huánuco.

Southern Mexico to Panama; Jamaica; Hispaniola; Venezuela and Colombia to Bolivia and Brazil.

This is part of a large complex of species including, among others, *G. alsopteris*, *G. leucosticta*, *G. pichinchensis*, and *G. david-smithii* and characterized by conspicuously setose stem scales and axes provided with orange to castaneous, spreading, unicellular trichomes 0.4–2 mm long. Most species have pectinate laminae, with linear pinnae or segments, white-encrusted hydathodes, and are host to a black, clavate, ascomycete, *Acrospermum maxonii* Riddle, which grows especially on the costae and among the sori. Because of the very subtle differences and misapplied species names, great confusion has attended both taxonomy and nomenclature. Furthermore, specimens of *G. taxifolia* and a few of its closest relatives are often identified as species within this complex, as they share some of these same diagnostic features, and are also hosts to *Acrospermum*. However, *G. taxifolia* can be separated by the stem scales, which lack marginal setae, and the pale, sericeous trichomes on the petiole and lamina. Also, it is likely that some of the species are hy-

bridizing, and monographic study is sorely needed of the entire group.

Amazonas: Cerros Calla Calla, between Leimebamba and Balsas, *Hutchison & Wright 5827a* (GH, UC). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Léon 2159* (UC), *Young 2659* (USM), *2728* (USM), *3187* (USM). **Huánuco:** Muña, trail to Tambo de Vaca, *Macbride 4294* (F, US).

62. *Grammitis blepharidea* (Copel.) Stolze, *comb. nov.*

Polypodium blepharideum Copel., Univ. Calif. Publ. Bot. 19: 304. 1941. TYPE: Peru, Huánuco, Dist. Churubamba, Cresta Santa Toribio, *Mexia 8147a* (holotype, UC; isotype, US!; photos, F & GH of US).

Polypodium buesii Maxon, Contr. Gray Herb. 165: 72. 1947. TYPE: Peru, Cuzco, Cerro Chuyapi, *Bües A45* (holotype, US!).

Xiphopteris blepharidea (Copel.) Copel., Amer. Fern J. 42: 99. 1952.

Xiphopteris buesii (Maxon) Copel., Amer. Fern J. 42: 105. 1952.

Grammitis buesii (Maxon) Lell., Amer. Fern J. 74: 58. 1984.

Plants epiphytic, rarely epipetric. **Stem** small, erect, provided with broad, flaccid, dull yellow scales, these 2–3 mm long, minutely clathrate, the margins entire or with scattered, minute, rotund glands. **Leaves** 8–20 cm long, 0.6–0.9 cm broad. **Petiole** 0.5–2.5 cm long, 0.4–0.7 mm in diameter, abundantly provided with stout, spreading reddish to castaneous, unicellular trichomes to 2 mm long, and with a few, scattered simple or branched septate trichomes 0.1–0.2 mm long. **Lamina** thin- to firm-herbaceous, linear-elliptic, divided nearly or quite to the rachis, strongly and gradually reduced at both ends, unicellular trichomes on rachis, surface and margins as on the petiole, but less abundant. **Pinnae** (or segments) 3–5 mm long, 1.5–2.5 mm broad, deltate or oblong-deltate, obtuse or subacute, margins entire. **Veins** usually simple, but fertile ones with a short acroscopic branch near the segment base on which the sorus is borne, hydathodes distinct, lacking calcareous deposits. **Sori** solitary at the base of each segment, sporangia glabrous.

In wet forests, on tree trunks, or very rarely at the base of rocky cliffs, 2000–2750 m, along the Cordillera Central from Cajamarca and Amazonas to Puno.

Endemic.

Copeland (1952b) separated this from *G. buesii* by only two characters: the latter with "toothed" stem scales and 1-forked veins; the former with entire scales and simple veins. The type of *Polypodium blepharideum* consists of two sterile, immature leaves, each pinna bearing a simple vein, and the stem scales apparently with no marginal processes. The type of *Polypodium buesii* contains mostly fertile leaves, their pinnae with a single vein and a short, basal, acroscopic spur that bears the sorus; however, on the few sterile leaves the veins are unbranched. Stem scales commonly have a few, nearly undetectable, rotund glands scattered along the margin, but at least a few scales have naked margins. The scale glands are delicate and apparently are easily dislodged. Therefore, the separation of *G. buesii* is unwarranted, since all other characters are identical.

Cajamarca: Prov. Cutervo, Chontacruz, San Andrés, Quiroz & Suarez 2894, in part (F). **Amazonas:** Prov. Chachapoyas, along Río Ventanilla W of Molinopampa, Wurdack 1511 (F, GH, UC, US). **Pasco:** Prov. Oxapampa, trail to Cordillera Yanachaga via Río San Daniel, D. Smith et al. 7853 (MO), 8490 (MO). **Cuzco:** Cabecera del Koribeni, Bües 1963 (GH, US). Cerro Chuyapi, Bües A38 (US). **Puno:** Prov. Sandia, slopes of Oconeque, E of Limbani, Hodge 6087 (F, GH, US).

63. *Grammitis taxifolia* (L.) Proctor, Rhodora 63: 35. 1961.

Polypodium taxifolium L., Sp. pl. 2: 1086. 1753. TYPE: Plumier t. 89, Traité foug. Amér., based on a Plumier specimen from Martinique.

Ctenopteris taxifolia (L.) Copel., Philipp. J. Sci. 84: 447. 1956.

Plants epiphytic. **Stem** short-creeping to erect, provided with narrow-deltate, rigid, lustrous, orange to red-brown scales, these 1–2.5 mm long, nonclathrate, the margins naked but the tip setose. **Leaves** 12–35 cm long, 3–6 cm broad. **Petiole** 3–10 cm long, 0.7–1.2 mm in diameter, abundantly provided with yellow or pale orange, sericeous, unicellular trichomes to 2 mm long. **Lamina** pectinate, 1-pinnate, thin- to firm-herbaceous, elliptic, gradually or abruptly reduced at both ends, trichomes on axes, surface and margins of segments as on the petiole, but less abundant and a little shorter. **Pinnae** 1.5–3.5 cm long, 3–5 mm broad, linear, adnate, obtuse or subacute, truncate at base, usually host to clavate, black fungi on the abaxial surface, margins entire. **Veins** simple, 6–18 pairs on a pinna, hydathodes distinct, rarely

(but not in Peru) with calcareous deposits. **Sori** medial, sporangia glabrous.

In wet forests, on tree trunks, 1950–2500 m, along the Cordillera Central from Amazonas to Pasco.

Costa Rica; Hispaniola; Puerto Rico; Lesser Antilles; Trinidad; Venezuela and Colombia to Brazil and Bolivia.

This is often confused with some of the species in the complex of *G. semihirsuta* (q.v.). There is a close resemblance in the size and shape of leaves, the pectinate lamina, and all are hosts to the distinctive black ascomycete *Acrosporum*, yet there are subtle but distinct diagnostic characters. Species in the *G. semihirsuta* complex have conspicuous setae on margins of stem scales, and petiole and rachis trichomes are stout, rigid, and castaneous. In *G. taxifolia* stem scales have an apical seta, but none on the margins, and axes trichomes are sericeous and yellow or orange. In addition, most species in the *semihirsuta* group have submarginal sori, whereas those in *G. taxifolia* are medial.

South American specimens seem to be more robust than West Indian ones, with thicker and broader laminae. Also, Proctor (Flora Lesser Antilles, 1977) contended that hydathodes of *G. taxifolia* are encrusted with the circular, calcareous deposits common to the *semihirsuta* group. However, these white dots are lacking on the Antillean specimens at Field Museum and are not present on any of the Peruvian material.

Amazonas: Prov. Bagua, 20 km E of La Peca, Barbour 2835 (F, MO). **San Martín:** Prov. Rioja, Pedro Ruiz-Moyobamba Road, Venceremos, D. Smith & Vásquez 4577 (MO, UC). **Huánuco:** Prov. Huánuco, road from Acomayo to Chinchao, Mexia 4142a (UC). **Pasco:** Prov. Oxapampa, trail to Cordillera Yanachaga via Río San Daniel, D. Smith et al. 7855 (F, MO, USM).

64. *Grammitis athyrioides* (Hooker) Morton, Contr. U.S. Natl. Herb. 38: 255. 1973.

Polypodium athyrioides Hooker, Sp. fil. 4: 224, t. 277b. 1863. TYPE: Peru, Junín, Pangoa (San Martín de Pangoa), Mathews 1103 (holotype, K!; photo, F).

Polypodium yungense Rosenst., Repert. Spec. Nov. Regni Veg. 5: 236. 1908. TYPE: Bolivia, North Yungas, Unduavi, Buchtien 891 (holotype, B?; isotype, US!).

Ctenopteris athyrioides (Hooker) Copel., Philipp. J. Sci. 84: 406. 1956.

Plants epiphytic. **Stem** short-creeping or decumbent, sparsely provided with narrow-deltate, non-clathrate scales, these 2–3 mm long, dark brown to black, with rigid brown or orange setae. **Leaves** lax, usually pendent, swollen and irregularly articulate at the stem, crowded to subfasciculate, 1-pinnate, 20–50 cm long, 2.5–6 cm broad. **Petiole** 6–10 cm long, 0.6–1.2 mm in diameter, amply provided with spreading trichomes, these orange to castaneous, 0.5–2 mm long. **Lamina** firm-herbaceous to chartaceous, reduced at apex and base. **Rachis** brown to blackish, amply provided with spreading, castaneous trichomes to 1 mm long. **Pinnae** slightly ascending, adnate, narrow deltate, deeply lobed to broadly crenate, at least near the base, commonly bearing some black clavate fungi on the abaxial surface. **Veins** commonly simple, hydathodes often covered by circular, calcareous deposits. **Sori** round, supramedial. Sporangia glabrous.

In forests, on tree trunks, 2100–3750 m, from Amazonas to Cuzco.

Peru and Bolivia.

A number of specimens have been determined as the Bolivian *Polypodium yungense*, the latter supposedly differing from *G. athyrioides* in the crenate (vs. deeply lobed) pinna margins. However, examination of type and other specimens from Peru and Bolivia identified as either species revealed no other differences. Throughout a large number of specimens there can be observed a progressive gradation from subentire to broadly crenate pinnae to those lobed about halfway to the costa; thus, it is presumed that the deeply lobed pinnae are simply manifestations of a more robust grown habit. Furthermore, the types of both exhibit two very distinctive features: short, blackish stem scales with brownish setae, and the (usual) presence of black, clavate fungi on the pinnae.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla above Leimebamba, *Hutchison & Wright* 6988 (US). Prov. Chachapoyas, slopes of Puma-Urcu, *Wurdack* 703 (GH, US). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *León* 1898 (UC), *Young & León* 4649 (USM). **Huánuco:** Muña, *Bryan* 550B (F). Muña, trail to Tambo de Vaca, *Macbride* 4305 (F), 4329 (F). **Cuzco:** Valle de Lares, above Río Lachae, *Bües* 1822 (US). Prov. La Convención, Dist. Vilcabamba, *Bües* 2116 (US). Below Abra de Malaga, 15 km from Quillabamba, *Ellenberg* 4776 (GH, in part).

65. *Grammitis myriophylla* (Baker) Morton,
Contr. U.S. Natl. Herb. 38: 108. 1967. **Figure**
5g.

Polypodium myriophyllum Baker, in Hooker and Baker, Syn. fil. 338. 1868. TYPE: Peru, Puno, Tatanara, *Lechler* 2567 (holotype, 2 sheets, K!; isotype, L; frag., US of L; photos, F of K, US of K & L).

Plants epiphytic. **Stem** suberect, very sparsely provided with minute, nonclathrate, ovate or deltate, orange scales, these 0.5–0.8 mm long, their margins subentire or with short, scattered glands. **Leaves** lax, pendent, not or scarcely articulate, densely fasciculate, 1-pinnate-pinnatisect to (rarely) 2-pinnate, 15–30 cm long, 2–5 cm broad. **Petiole** 3–9 cm long, 0.4–0.8 mm in diameter, copiously provided with orange, spreading, unicellular trichomes to 2 mm long. **Lamina** firm-herbaceous, gradually reduced at apex and base, rachis and segments moderately provided with deep-castaneous, rigid, spreading, unicellular trichomes. **Pinnae** ascending at a 40–60° angle, 1.5–5 cm long, 0.4–1 cm broad, linear to narrow-lanceolate, divided nearly or quite to the costa into well-spaced, linear segments, these rarely with a single, basal, linear segment. **Veins** simple, one to a pinna or ultimate segment, each terminating in a brownish hydathode. **Sori** round, solitary at the very base of each ultimate segment and much broader than the segment at maturity, sporangia glabrous.

In forests, on tree trunks and on thick layers of mosses on the forest floor, 2800–3400 m, Pasco, Cuzco, and Puno.

Ecuador to Bolivia.

Very similar to this (and perhaps to be combined with it) is *Polypodium longisetosum* Hooker of Ecuador (type not seen). The latter differs in the broadly oblong (vs. linear) ultimate segments. *Grammitis myriophylla* is not apt to be confused with any other species in the genus. It is easily distinguished by its nearly 2-pinnate leaves with strongly ascending pinnae, and the widely spaced ultimate segments which are so narrow that the mature sori extend beyond the margins.

Pasco: Prov. Oxapampa, Yanachaga National Park, path from Abra La Esperanza to Río Pescado, *León* 1005 (F). **Cuzco:** Altura de Sicre, *Bües* 1539 (US), 1554 (US). Prov. La Convención, Valle de San Miguel, *Bües* 2191 (US). Prov. La Convención, Cordillera Vilcabamba, *Dudley* 11134A (GH). Prov. Paucartambo, Cerro Macho Cruz, *León* 2301 (F).

66. *Grammitis immixta* Stolze, *sp. nov.*

Species haec ab *Grammite variabile* (Kuhn) Morton differt pubibus densioribus, hydathodibus calcareis, et trichomibus longis, stellatis castaneisque vel simplicibus pallidisque immixtis.

Plants epiphytic, possibly also epipetric. **Stem** suberect, provided with a few orange, ovate or deltate, nonclathrate scales, these 1–1.5 mm long, the margins with long, pale setae. **Leaves** lax, pendent, not or scarcely articulate, fasciculate, 2-pinnate, 15–50 cm long, 2.5–7 cm broad. **Petiole** 2–6 cm long, 0.2–0.5 mm in diameter, sparsely to amply provided with thin, yellow, spreading, unicellular trichomes 1–2 mm long. **Lamina** firm-herbaceous, gradually reduced to apex and base, rachis and segments densely covered with (and often obscured by) trichomes like those of the petiole, and intermixed with castaneous ones, these stellately branched at base into 5–6 long arms. **Pinnae** ascending at a 20–60° angle, 2.5–7 cm long, 0.4–0.6 cm broad, linear, bearing many crowded, oblong to nearly circular segments. **Veins** simple in each ultimate segment, hydathodes usually encrusted with a round, calcareous deposit. **Sori** one to a segment, sporangia provided with rigid setae, these often longer than the sporangia.

TYPE—Peru, Cuzco, Prov. La Convención, Distr. Vilcabamba, Ruina Idma-huasi, *Bües 2103* (holotype, US!; isotypes, F!, GH!, MO!).

In forests, on tree trunks (or, though not stated on labels, possibly pendent from rocky walls of ruins), 3200–3650 m, Cuzco.

Endemic.

This is closely related to *G. variabilis*, but in addition to the characters used in the key, it can be distinguished further by the density of the pubescence. Although trichomes on the lamina of *G. variabilis* are abundant, the tissue of the segments is always evident beneath them. However, in *G. immixta* the segments are so copiously villous that their surfaces are often completely obscured, especially abaxially.

Cuzco: Ccarcco, *Bües 1393* (US, in part). Prov. La Convención, Abra Mirador, *Bües 2071* (US). Prov. Urubamba, Machu Picchu, *Peyton & Peyton 1102* (MO).

67. *Grammitis variabilis* (Kuhn) Morton, Contr. U.S. Natl. Herb. 38: 102. 1967.

Polypodium variabile Kuhn, Linnaea 36: 133. 1869.
SYNTYPES: Ecuador, Andes of Quito, *Jameson* (B?, K!; photo, F of K); New Granada (Colombia), *Purdie* (B?).

Plants epiphytic, rarely epipetric. **Stem** suberect, provided with a few orange or brown, ovate or deltate, nonclathrate scales, these 1–1.5 mm long, the margins with pale setae. **Leaves** lax, pendent, not or scarcely articulate, fasciculate, 2-pinnate, not or very rarely forked, 15–30 cm long, 2–4 cm broad. **Petiole** 2–5 cm long (often appearing longer because of deciduous proximal pinnae), 0.2–0.4 mm in diameter, amply provided with yellow or orange, spreading, unicellular trichomes to 2 mm long. **Lamina** membranaceous to firm-herbaceous, reduced to apex and base, rachis and segments amply pilose like the petiole, but the long trichomes of the rachis sparsely to moderately intermixed with minute (0.1–0.3 mm), septate, simple or branched, gland-tipped ones. **Pinnae** ascending at a 40–60° angle, 1–4 cm long, 0.3–0.7 cm broad, linear to narrow-lanceolate, bearing several to many, approximate to crowded, oblong to circular segments. **Veins** simple in each ultimate segment, each terminating in a brownish hydathode. **Sori** round, one to a segment, sporangia provided with rigid setae, these sometimes longer than the sporangia.

In forests, on tree trunks, or rarely in crevices of rocky cliffs, 3350–3950 m, Junín and Cuzco.

Colombia to Peru.

Copeland (1956) included this with *G. heteromorpha*, suggesting that the two differed only in the dissection and branching of the lamina, but there are other distinctions, particularly the rachis indument and, less obviously, the stem base. Neither of the type specimens (and few extant specimens) seen have stems, but those few seen are swollen and articulate at base in *G. heteromorpha*, but not or scarcely so in *G. variabilis*. Although rachises of both species are abundantly provided with the same abundant, long-spreading, light-colored, unicellular trichomes, each has another kind of trichome intermixed: in *G. heteromorpha*, some scattered, long castaneous, sessile-stellate ones; in *G. variabilis*, some minute, septate, gland-tipped ones.

There are two sheets in the type folder of *Polypodium heteromorphum* at Kew, one with 2-pinnate leaves and the other with 1-pinnate but forking leaves. Both are Jameson specimens from the “Andes of Quito.” Hooker obviously considered

these the same collection, and even the original drawing (Icon. fil. t. 108) was based on the two different lamina patterns, hence the epithet "heteromorpha." On the sheet with the 2-pinnate leaf is pencilled, in a different hand (Mettenius?) "P. variabile Mett." It is not certain if Mettenius saw this as well as another Jameson syntype (B?), but it differs from the holotype of *P. heteromorpha* in the characters mentioned above.

Obviously, there are a number of problems concerning these two species and *G. dependens*, and the entire group is in need of further study.

Junín: San José, *Macbride 1108* (F, US). **Cuzco:** Sucracucha (?), *Bües 1585* (US). Ccarcco, *Bües 1393* (US, in part). Prov. La Convención, NE of Hacienda Luisiana, *Dudley 11189* (GH, US).

II. *Pecluma*

Pecluma Price, Amer. Fern J. 73: 109. 1983. TYPE: *Pecluma pectinata* (L.) Price (*Polypodium pectinatum* L.). **Figure 6.**

Plants epiphytic or epipetric, occasionally terrestrial. *Stem* short, creeping to decumbent or suberect, unbranched, not glaucous, bearing often-proliferous roots and abundant scales, the latter basally attached, nonclathrate, and with essentially undifferentiated margins. *Leaves* monomorphic, fasciculate to crowded (not over 1.5 cm apart), short- or long-petiolate, the petiole terete, dark brown or black, articulate to short phyllopodia. *Lamina* pectinate, deeply incised nearly or quite to the rachis into numerous, narrow, usually crowded segments, sparsely to amply provided with pluricellular trichomes on laminar surface and/or

rachis. **Veins** free or casually anastomosing, forked (or simple in 3 species). **Sori** terminal on the simple, basal acroscopic vein branch, exindusiate, the receptacle paraphysate, sporangia glabrous or setose, the stalks with 2–3 rows of cells. **Spores** monolete, bilateral, reniform to subglobose, yellow (not chlorophyllous).

The genus contains about 27 species from tropical or subtropical regions of the New World. It is especially distinguished by the pectinate lamina with pluricellular trichomes, the dark, terete petioles articulate to short phyllopodia, the short, unbranched stems bearing basally attached, non-clathrate scales, and the exindusiate sori borne on the tips of usually free veinlets. The pectinate aspect of the lamina is imparted by the numerous, crowded, spreading, linear segments, which are entire, or occasionally crenate. Only in *P. funicula* (Fée) Price of Cuba and *P. c'oquetangensis* (Rosenst.) Price of Bolivia are the segments conspicuously pinnatifid. According to Price (1983) *Pecluma* shares ancestry with *Polypodium* and *Ctenopteris* (*Grammitis* subg. *Cryptosorus*), with whose species it is commonly confused. This treatment essentially follows that of Evans (1969). Eleven species are known from Peru.

References

EVANS, A. M. 1969. Interspecific relationships in the *Polypodium pectinatum-plumula* complex. Ann. Missouri Bot. Gard., 55: 193–293.
PRICE, M. G. 1983. *Pecluma*, a new tropical American fern genus. Amer. Fern J., 73: 109–116.

Key to Species of *Pecluma*

- a. Rachis scales lanceolate to ovate, conspicuous and persistent, at least abaxially; rachis and petiole black (or brown in *P. filicula*) b
- b. Leaf 6–18 cm long; petiole and rachis brown; stem scales ovate, to 1–2 mm long 2. **P. filicula**
- b. Leaf 20–60 cm long; petiole and rachis black; stem scales linear or narrow-deltate, 2–5 mm long 1. **P. plumula**
- a. Rachis scales lacking, or sparse, filiform, and inconspicuous; rachis and petiole brown c
- c. Proximal segments not reduced, or basal pair at least half as long as the longest ones d
- d. Costae perpendicular to rachis; sori mostly supramedial; sporangia glabrous 5. **P. divaricata**
- d. Costae decurrent on rachis; sori medial; sporangia setose 11. **P. hygrometrica**
- c. Proximal segments strongly reduced, often to only wings or auricles e
- e. Segments, especially distal ones, usually ascending at a 45–50° angle; rachis abaxially with scattered trichomes to 1.5 mm long 4. **P. curvans**

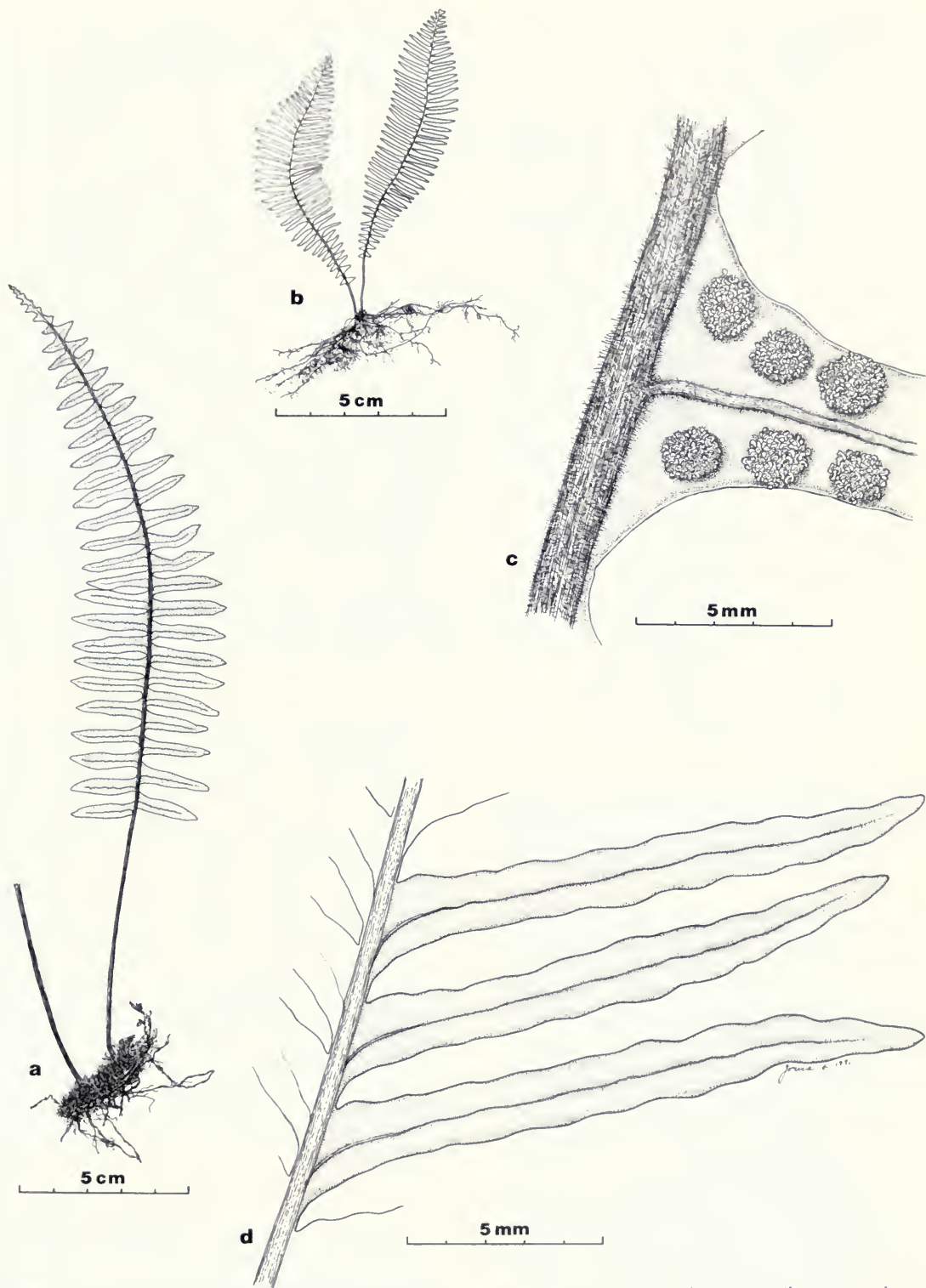


FIG. 6. *Pecluma hygrometrica*: a, habit. *Pecluma filicula*: b, habit. *Pecluma eurybasis* var. *pilosa*: c, portion of rachis with pinna base. *Pecluma curvans*: d, rachis and pinnae. (a from Moran 3665, F; b from Tryon & Tryon 5373, F; c from Young 4938, USM; d from Soukup 3642, US.)

- e. Segments patent to slightly ascending, or sometimes basal ones deflexed; rachis trichomes of various lengths f
- f. Base of segments asymmetrical, mostly perpendicular or rounded acroscopically, decurrent basiscopically; trichomes on segment margins lacking or scattered and inconspicuous 3. *P. absidata*
- f. Base of segments essentially symmetrical, or if asymmetrical then decurrent acroscopically and perpendicular basiscopically; trichomes conspicuous on segment margins (sometimes caducous) g
- g. Lamina base with a few segments $\frac{1}{5}$ – $\frac{1}{2}$ the length of larger ones; sporangia glabrous h
- h. Trichomes on rachis 0.2–0.5 mm long, on costa 0.2–0.3 mm long; veins glabrous 6. *P. eurybasis*
- h. Trichomes on rachis (at least abaxially) 0.6–1 mm long, on costa 0.4–0.8 mm long; veins sparsely to moderately provided with acicular trichomes 0.4–0.8 mm long 8. *P. venturii*
- g. Lamina base gradually or abruptly reduced to rudimentary segments or wings; sporangia with 1–3 capsular (often deciduous) setae j
- i. Laminar tissue glabrous except for a small, oblong patch of minute trichomes surrounding the sorus; costa perpendicular to the rachis; veins free 10. *P. ptilodon*
- i. Laminar tissue regularly pilose or minutely puberulent; costa slightly to strongly decurrent on the rachis; veins free to partly anastomosing k
- j. Rachis abaxially puberulent with trichomes 0.1–0.2 mm long; lamina abruptly reduced to a few small lobes or auricles; trichomes on costa and laminar tissue inconspicuous, 0.1 mm long 7. *P. pectinata*
- j. Rachis abaxially pilose with trichomes 0.4–0.8 mm long; lamina cuneate to attenuate at base, the segments (often many) gradually reduced to small lobes or auricles; trichomes on costa and laminar tissue usually conspicuous, 0.3–0.5 mm long 9. *P. camptophyllaria*

1. ***Pectuma plumula*** (Willd.) Price, Amer. Fern J. 73: 115. 1983.

Polypodium plumula Willd., Sp. pl. ed. 4, 5: 178. 1810.
LECTOTYPE (designated by Evans, 1969, p. 230):
Venezuela, Caracas, Bredemeyer (B, Herb. Willd. 19655-1; frag., NY; photos, F, GH).

Plants epiphytic, epipetric or terrestrial. **Stem** short-creeping, provided with linear or narrow-deltate, acuminate or attenuate, reddish brown scales, these 2–5 mm long, subentire, often with a filiform tip. **Leaves** 20–60 cm long, crowded to subfasciculate. **Petiole** 2–10(–12) cm long, black. **Lamina** elliptic or elliptic-lanceolate, 3–7.5 cm broad, gradually or abruptly reduced at base. **Rachis** black, abaxially provided with orange to reddish brown scales, these cordate to basifixed, plane to sub-bullate, often ciliate, to 1 mm long, and with scattered to abundant, acicular, pluricellular trichomes. **Segments** perpendicular to the rachis, or distal ones slightly ascending, the costae, margins, and (occasionally) the laminar surface pubescent like the rachis. **Veins** obscure, 1(–2)-forked, free. **Sori** medial to supramedial. **Sporangia** setose.

In forests and wooded canyons, on trees or fallen logs, on rocks or in rock crevices, occasionally on the forest floor, 100–2000 m, Amazonas and Loreto, south to Ayacucho and Madre de Dios.

United States (Florida); Mexico to Panama; West Indies; Colombia to the Guianas, south to Bolivia and Brazil.

Practically indistinguishable from this is *P. dispersa* (Evans) Price, which shares the same range, but which heretofore has not been found in Peru. Evans (1969) described the latter as a triploid, with 32 spores per sporangium, whereas *P. plumula* is a tetraploid, with 64 spores per sporangium. The only other distinctions given between the two taxa were that the stem scale margins of *P. plumula* are somewhat papillose and the veins are rarely twice forked, whereas scale margins of *P. dispersa* are somewhat papillose and the veins are often twice forked.

Amazonas: Prov. Bongará, Shipasbamba-Pomacocha trail, *Wurdack* 1093 (F, GH, US). **San Martín:** Alto Río Huallaga, *Ll. Williams* 5586 (F). **Loreto:** Mishuyacu, near Iquitos, *Klug* 1382 (F, US). Prov. Maynas, Lupuna Cocha, *Tryon & Tryon* 5186 (F, GH, US). **Huánuco:** Piedra Grande Estación, near Santo Domingo, *Macbride* 3703 (F,

GH, US). **Junin:** La Merced, *Killip & Smith 23796* (F, US). **Yaupe:** *Woytkowski 6393* (GH, MO, US). **Ayacucho:** "Aina" (Ayna), *Tidschack 89* (B). **Cuzco:** Prov. La Convención, Vilcanota Valley, *Mexia 8090* (F, GH, MO, NY, UC, US). **Madre de Dios:** Prov. Manú, Parque Nacional del Manú, Cocha Cashu, *Foster et al. 3454* (F).

2. ***Pecluma filicula*** (Kaulf.) Price, Amer. Fern J. 73: 114. 1983. **Figure 6b.**

Polypodium filicula Kaulf., Enum. fil. 275. 1824. TYPE: Brazil, *Chamisso* (holotype, LE?).

Plants epiphytic or epipetric. **Stem** very short-creeping, provided with ovate, acute, brown or reddish brown scales, these about 1–2 mm long, subentire or finely serrulate. **Leaves** 6–18 cm long, fasciculate. **Petiole** 0.5–4 cm long, reddish brown. **Lamina** elliptic, 1.5–3 cm broad, tapered gradually at both ends. **Rachis** reddish brown, amply and conspicuously provided abaxially with reddish brown, cordate, sub-bullate, subentire to denticulate scales to 1 mm long and abundantly pubescent on both sides with acicular, pluricellular trichomes to 0.3 mm long. **Segments** perpendicular to the rachis, or distal ones slightly ascending, the costae and margins pubescent like the rachis. **Veins** simple, free. **Sori** supramedial. **Sporangia** lacking setae.

In wet forests, on trees or fallen logs, or on rocks or in crevices of rock walls, 800–2400 m, Cajamarca, Amazonas, San Martín, Huánuco, and Cuzco.

Colombia to Argentina and southern Brazil.

This is the smallest species of *Pecluma* in Peru and is also notable for the simple veins, broad, cordate, conspicuous rachis scales, and supramedial sori.

Cajamarca: Prov. Jaén, Chontalí, *Chimoy 261* (USM). **Amazonas:** Prov. Bagua, on Cerro Tapur ca. 40 km S of Bagua Grande, *Hutchison 1472* (UC, US). **San Martín:** San Martín, km 28 of Tarapoto–Yurimaguas road, *Knapp & Mallet 8402* (F, MO). **Huánuco:** Muña, *Bryan 431* (F). **Yanano,** *Macbride 3820* (F, US). **Muña,** *Woytkowski 5216* (GH, MO, US). **Cuzco:** Prov. La Convención, Río Chupimayo, *Soukup 807* (F). **Prov. La Convención,** Potrero, 8 km W of Quillabamba, *Tryon & Tryon 5373* (F, GH, US).

3. ***Pecluma absidata*** (Evans) Price, Amer. Fern J. 73: 113. 1983.

Polypodium absidatum Evans, Ann. Missouri Bot. Gard. 55: 238. 1969. TYPE: Colombia, Dist. Santander, Páramo de Romeral, *Killip & Smith 18518* (holotype, US; isotype, GH!).

Plants epiphytic or epipetric. **Stem** rather long-creeping, the scales linear to narrow-deltate, attenuate, light or dark brown, sublustrous, subentire, 3–6 mm long. **Leaves** 20–40(–50) cm long, approximate. **Petiole** 3–8 cm long, reddish brown. **Lamina** subcoriaceous, 4–6 cm broad, elliptic, rather abruptly reduced at base. **Rachis** reddish brown, scales lacking or rare and filiform, sparsely provided abaxially with acicular trichomes about 0.4 mm long, and moderately to amply adaxially with trichomes 0.7–1 mm long. **Segments** (at least distal ones) somewhat ascending, at a 60–70° angle, most of these nearly perpendicular to or rounded at the rachis acroscopically, decurrent basiscopically, the costae strongly decurrent, glabrous or with scattered trichomes, the margins usually sinuate and glabrous or with scattered, inconspicuous trichomes. **Veins** free, obscure, 1-forked. **Sporangia** with 1 or 2 long setae. **Sori** medial.

In forests or at edges of clearings, on rocks or trees, 2900–3700 m, Cajamarca, La Libertad, and Ancash.

Greater Antilles; Venezuela; Colombia to Bolivia.

This is easily confused with those specimens of *P. curvans* whose pinnae are not strongly ascending. See treatment of the latter for further discussion.

Cajamarca: Prov. Celendín, Canyon of Río Marañón above Balsas, *Hutchison & Wright 5324*, in part (F, GH). **La Libertad:** Prov. Otuzco, near Agallpampa, *López 1024* (HUT, US). **Ancash:** Prov. Yungay, near Laguna Llanganuco, *Mostacero et al. 1417* (HUT, MO).

4. ***Pecluma curvans*** (Mett.) Price, Amer. Fern J. 73: 114. 1983. **Figure 6d.**

Polypodium curvans Mett., Ann. Sci. Nat. Bot. 5, 2: 253. 1864. TYPE: Peru, Agapata, *Lechler 2006* (holotype, B; isotypes, B, GH!, L, possible isotype, F; frag., US; photos, F of B, US of L).

Polypodium circinatum Sodiro, Crypt. vasc. Quit. 333. 1893. TYPE: Ecuador, Azuay, near Cuenca, *Rimbach 35* (holotype, Q or QCA).

Plants epiphytic or epipetric, rarely terrestrial. **Stem** short- to long-creeping, the scales narrow-deltate, attenuate, castaneous, lustrous, entire, 2–4 mm long. **Leaves** 15–35(–40) cm long, approximate or fasciculate, with apex often circinate at apex even at maturity. **Petiole** 2–8 cm long, dark reddish brown. **Lamina** firm-herbaceous to chartaceous, elliptic, 3–10 cm broad, gradually nar-

rowed to apex and base. **Rachis** reddish brown, scales lacking or rare and filiform, abaxially with scattered acicular (sometimes caducous) trichomes 1–1.5 mm long, trichomes scattered adaxially, 0.4–1 mm long. **Segments** (at least distal ones) strongly ascending, at a 45–50° angle, most of them with base nearly perpendicular to or rounded at the rachis acroscopically, decurrent basiscopically, the costae and laminar tissue subglabrous or with scattered, acicular trichomes 0.4–0.8 mm long, the margins sinuate and essentially glabrous. **Veins** indistinct or obscure, 1-forked, free. **Sori** medial. **Sporangia** with 1 or 2 setae about the length of the capsule, these usually deciduous on mature sporangia.

In forests and wooded canyons, on tree trunks and branches, or among rocks or on rocky cliffs, rarely on mossy earth, 1600–4000 m, Cajamarca to Apurímac and Puno.

Ecuador to Bolivia.

Some specimens of *Pecluma curvans* from Peru, atypical in their scarcely ascending pinnae, may be confused with *P. absidata* or *P. camptophyllaria* var. *abbreviata*. These can be distinguished from the latter by the virtually glabrous pinna margins (vs. margins with conspicuous trichomes) and from both by the much longer (nearly 2 mm) flexuous, abaxial rachis trichomes and by the often circinate leaves (even at maturity).

Cajamarca: Cerro Cumbre Mayo, *Sánchez V.* 35 (GH, US). **La Libertad:** Prov. Bolívar, Nevado de Cajamarquilla, *López & Sagástegui* 3235 (GH, HUT, MO). **Ancash:** NW slope of Nevada de Huascarán, below Llanganuco, *Correll & Smith* P955 (US). Prov. and Dist. Yungay, Llanganuco, *Saunders* 516 (F). **Huánuco:** Chasqui, *Macbride & Featherstone* 1949 (F, US). **Junín:** Huancayo, Quebrada de Occopilla, *Soukup* 3642 (F, GH, US), 3646 (F), 5884 (GH). **Huancavelica:** Prov. Tayacaja, Ampurco, *Tovar* 3763 (GH). **Apurímac:** Prov. Abancay, Ampay, Tamburco, *Núñez & Vargas* 7213 (MO, UC). **Cuzco:** Molepata, above Pincopata, *Bishop* 2530 (US). Prov. Paucartambo, Hacienda Churi, *Herrera* 271 (GH, US), 1655 (US). **Puno:** Granja Salcedo, near Puno, *Soukup* 64 (F, UC).

5. *Pecluma divaricata* (Fourn.) Mickel & Beitel, Mem. New York Bot. Gard. (Pterid. fl. Oaxaca) 46: 269. 1988.

Polypodium divaricatum Fourn., Mexic. pl. 1: 180. 1872. TYPE: Mexico, Veracruz, Zacupán, *Gal-eotti* 6287 (holotype, p; isotypes, B, BR, G).

Polypodium bolivianum Rosenst., Repert. Spec. Nov. Regni Veg. 5: 236. 1908. TYPE: Bolivia, South Yungas, Sirupaya, near Yanacachi, *Buchtien* 481 (holotype, s; isotype, us!).

Pecluma boliviana (Rosenst.) Price, Amer. Fern J. 73: 113. 1983.

Plants epiphytic (at least in Peru). **Stem** short-to long-creeping, the scales linear to narrow-deltate, acuminate or attenuate, orange to dark brown, 2–5 mm long, often remotely ciliate or ciliolate. **Leaves** (35–)42–130 cm long, approximate to 2 cm apart. **Petiole** 8–25 cm long, reddish brown. **Lamina** narrow-deltate, (8–)10–25 cm broad, truncate or occasionally with a few proximal segments slightly reduced. **Rachis** reddish brown, scales lacking or sparse, filiform and inconspicuous, sparsely and minutely pubescent on the abaxial side. **Segments** perpendicular to the rachis, glabrous or sparsely and minutely pubescent abaxially, tissue subglabrous adaxially, the costa perpendicular to the rachis, not or scarcely decurrent. **Veins** usually obscure, 2–3-forked. **Sori** mostly supramedial, receptacle surrounded by a small cluster of setiform trichomes, these obscured when sporangia are mature. **Sporangia** glabrous.

In forests or thickets, on tree trunks, 1000–2400 m, along the Cordillera Central from Amazonas to Cuzco.

Southern Mexico to Panama; Venezuela; Columbia to Bolivia.

Some specimens of *P. eurybasis* may be confused with *P. divaricata* in that the laminae are very large and subtruncate and the costae are not or scarcely decurrent on the rachis. However, in the former species the rachis is moderately to densely villous, whereas in *P. divaricata* it is glabrous or sparsely pubescent.

Bryan 517 (F), from Muña, Dept. Huánuco, is an aberrant form: the lamina base is truncate but with a few greatly reduced pinnae and with costae somewhat decurrent on the rachis. Many abortive sporangia appear among the normal ones, so this is apparently a hybrid. Some characters, including indument, suggest *P. pectinata* as a putative parent, but the specimen was collected at 2150 m, and *P. pectinata* does not occur in Peru above 790 m. *Barbour* 4179, from Amazonas (MO), is another aberrant form, also with abortive sporangia.

Amazonas: Trail E of La Peca in Serranía de Bagua, *Gentry et al.* 22972 (MO, US). **San Martín:** Prov. Rioja, Venceremos, *D. Smith* 4462 (MO). **Huánuco:** Muña, *Bryan* 546 (F), 556 (F). **Junín:** Huacapistana, *Coronado* 272 (GH, UC, US). Prov. Satipo, road to La Merced, *León et al.* 184 (MO, USM). Chanchamayo Valley, *C. Schunke* 118 (US). **Pasco:** Oxapampa (as Junín), *Soukup* 2347 (GH). Villa Rica, *Woytkowski* 7346 (GH, MO, US). **Cuzco:** San

Miguel, Urubamba Valley, *Cook & Gilbert 1752* (us), 1762 (us).

6. ***Pecluma eurybasis*** (C. Chr.) Price, Amer. Fern J. 73: 114. 1983.

Plants terrestrial or epiphytic, occasionally epipetric. **Stem** usually long-creeping, the scales linear to narrow-deltate, attenuate, light to dark brown, 2–5 mm long. **Leaves** 25–120 cm long, approximate. **Petiole** 7–35 cm long, reddish brown. **Lamina** herbaceous to subcoriaceous, 5–22 cm broad, narrow-ovate, abruptly reduced at base, with a few segments $\frac{1}{2}$ – $\frac{1}{2}$ the length of the longest ones. **Rachis** reddish brown, scales lacking or rare and filiform, moderately to densely villous, the mostly

Key to Varieties

- a. Rachis sparsely to moderately provided with acicular trichomes 0.2–0.3 mm long; stem scales often inconspicuously ciliolate 6a. var. **glabrescens**
a. Rachis densely villous with acicular trichomes 0.2–0.5 mm long; stem scales entire 6b. var. **villosa**

6a. ***Pecluma eurybasis* var. *glabrescens*** (Rosenst.) Lell., Amer. Fern J. 74:59. 1984.

Polypodium lachniferum var. *glabrescens* Rosenst., Repert. Spec. Nov. Regni Veg. 11: 57. 1912. TYPE: Bolivia, North Yungas, Unduavi, *Buch-tien 2770* (holotype, s; isotype, us!).

Polypodium eurybasis var. *glabrescens* (Rosenst.) Evans, Ann. Missouri Bot. Gard. 55: 244. 1969.

In wet and rocky soil, 2000–2800 m, Cajamarca. Costa Rica; Venezuela; Colombia to Bolivia.

Cajamarca: Prov. Contumazá, Cruz del Hueco, *Sagástegui et al. 9926* (HUT, MO, UC). Prov. and Dist. Cajamarca, Lluscapampa, *Sánchez 373* (GH).

6b. ***Pecluma eurybasis* var. *villosa*** (Evans) Lell., Amer. Fern J. 74: 59. 1984. **Figure 6c.**

Polypodium eurybasis var. *villosum* Evans, Ann. Missouri Bot. Gard. 55: 245. 1969. TYPE: Colombia, Cundinamarca, above Bogotá, *Fosberg 19688* (holotype, us!; isotype, us!).

In forests, thickets, or wooded canyons, on tree trunks, in humus or among rocks, 2000–2750 m, Amazonas to Cuzco.

Panama; Venezuela; Colombia to Bolivia.

Amazonas: Prov. Chachapoyas, Puma-urcu SE of Chachapoyas, *Wurdack 555* (us). **San Martín:** Prov. Mar-

acicular trichomes 0.2–0.4(–0.5) mm long. **Segments** perpendicular to the rachis, the base expanded symmetrically, or sometimes perpendicular to the rachis acroscopically, costae mostly perpendicular to the rachis and sparsely to densely puberulent with acicular trichomes 0.2–0.3 mm long. **Veins** usually distinct, 1–2-forked, free, glabrous. **Sori** medial. **Sporangia** glabrous.

Evans (1969) recognized three varieties of this species: var. *eurybasis* from the Greater Antilles and Venezuela, and vars. *glabrescens* and *villosa*, both from southern Central America to Bolivia. He separated var. *glabrescens* from the first of these on the basis of its once- (vs. twice-) forked veins.

iscal Cáceres, Río Abiseo National Park, *Young & León 4938* (USM). **Loreto:** Leticia, on Amazon River, *Ll. Williams 3040* (F). **Huánuco:** Cani, 7 mi SE of Mito, *Macbride 3407* (F, US). Muña, trail to Tambo de Vaca, *Macbride 4280* (F, US). Mito, *Macbride & Featherstone 1621* (F, US), 1731 (F, US). **Pasco:** Prov. Oxapampa, trail to Cordillera Yanachaga via Río San Daniel, *D. Smith et al. 7854* (MO). **Cuzco:** Quillabamba, Santa Teresa, 0.5 km W of La Playa, *Peyton & Peyton 1234* (GH, MO).

7. ***Pecluma pectinata*** (L.) Price, Amer. Fern J. 73: 115. 1983.

Polypodium pectinatum L., Sp. pl. 1085. 1753. LECTOTYPE (designated by Evans, 1969, p. 246): *Plumier t. 37*, Descr. pl. Amér., based on a specimen from Martinique.

Goniophlebium pectinatum (L.) John Sm., London J. Bot. 4: 57. 1842.

Plants epiphytic or epipetric, occasionally terrestrial. **Stem** short- or long-creeping, the scales 3–6 mm long, orange to reddish brown, linear, with an attenuate, often filiform, tip. **Leaves** 20–100 cm long, crowded to approximate. **Petiole** (3–) 4–15 cm long, reddish brown. **Lamina** firm-herbaceous to chartaceous, 3–9 cm broad, abruptly reduced to a few small lobes, wings, or auricles. **Rachis** reddish brown, scales lacking or rare and filiform, abaxially minutely puberulent, the trichomes 0.5–2 mm long. **Segments** perpendicular to the rachis, the base expanded symmetrically,

the margins with ample, trichomes, the costae slightly decurrent on the rachis, the costae, veins and lamina tissue regularly but minutely and inconspicuously puberulent with trichomes 0.05–0.1 mm long. **Veins** indistinct or obscure, 1–2-forked, mostly anastomosing. **Sori** medial. **Sporangia** capsules each usually bearing a single seta.

In deep forests or wooded ravines, on tree trunks or branches, fallen logs, rocks, or occasionally on the forest floor, 150–750 m, Huánuco and Loreto to Cuzco and Madre de Dios.

Costa Rica and Panama; West Indies; Venezuela; Columbia to Peru.

For a long time this name was a catchall for many species of *Polypodium* in the *Pecluma* group, so that it was perceived to be far more common than it actually is. Evans (1969) found it to be a plant of lower elevations, usually under 1000 m (or lower in Peru). It is characterized by the strongly and abruptly reduced lamina, which is regularly though minutely and inconspicuously puberulent.

Loreto: Bank of Río Santiago above Pongo de Manseriche, *Mexia* 6212 (F, GH, MO, UC, US). **Huánuco** (as San Martín): Ridge east of Tingo María, *Allard* 21442 (US). **Ucayali** (as San Martín): Boquerón Pass, 92 km from Tingo María, *Allard* 21734 (US). **Pasco:** Prov. Oxapampa, Palcazú, Río Alto Iscozacín, *Foster et al.* 10115 (F). **Cuzco:** Prov. La Convención, Río Apurímac, above Boca de Tigre rapids, *Davis et al.* 1301 (F, CH). **Madre de Dios:** Parque Nacional de Manú, Cocha Cashu Station, *Foster & Terborgh* 6632 (F).

8. *Pecluma venturii* (de la Sota) Price, Amer. Fern J. 73: 115. 1983.

Polypodium venturii de la Sota, Opera Lilloana 5: 186. 1960. TYPE: Argentina, Tucumán, Tañi, *Venturi* 1232 (holotype, LIL).

Plants epiphytic or terrestrial. **Stem** short- to long-creeping, the scales broad- or narrow-deltate, acuminate or attenuate, sublustrous, reddish brown, 1–2 mm long. **Leaves** 28–60 cm long, approximate. **Petiole** 5–12 cm long, reddish brown. **Lamina** firm-herbaceous to chartaceous, 6–10 cm broad, narrow-ovate, abruptly reduced at base, with a few segments $\frac{1}{4}$ – $\frac{1}{2}$ the length of the longest ones. **Rachis** reddish brown, scales lacking or rare and filiform, abundantly pilose, the acicular trichomes 0.6–1 mm long abaxially, a little shorter adaxially. **Segments** perpendicular to the rachis, the base expanded symmetrically, the margins with ample, minute, trichomes, the costae perpendicular to or

somewhat decurrent on the rachis and amply provided on both sides with acicular trichomes 0.4–0.8 mm long. **Veins** distinct or indistinct, 1–2-forked, free, sparsely to moderately provided with acicular trichomes 0.4–0.8 mm long. **Sori** medial or inframedial. **Sporangia** glabrous.

In and at edges of forests, on trunks or branches of trees, on fallen logs or in rocky soil, 2300–3600 m, Lambayeque, Cajamarca, San Martín, Huánuco, and Cuzco.

Ecuador; Peru; Argentina.

Lambayeque: Prov. Ferreñafe, 7 km NW of Incahuasi, *Dillon & Skillman* 4111 (F, GH, UC). **Cajamarca:** Colasay, *Woytkowski* 7013 (MO, US). **San Martín:** District Hualaga, Valley of Río Apisoncho 30 km above Jucusbamba, *Hamilton & Holligan* 516 (US). **Huánuco:** Mito, *Bryan* 191 (F). **Pampayacu,** *Kanehira* 183 (US). **Cuzco:** Prov. La Convención, Garavito, Hacienda Potrero, *Vargas* 13214 (GH).

9. *Pecluma camptophyllaria* (Fée) Price, Amer. Fern J. 73: 113. 1983.

Plants epipetric, epiphytic, or terrestrial. **Stem** short- to long-creeping, the scales 2–5 mm long, light to dark reddish brown, linear to narrow-deltate, the apex attenuate and often with a filiform tip. **Leaves** 16–150 cm long, crowded to approximate. **Petiole** 2–20 cm long, reddish brown. **Lamina** firm-herbaceous to subcoriaceous, attenuate at base, segments (often many of them) gradually reduced to lobes or auricles. **Rachis** reddish brown, scales essentially lacking, abaxially densely pilose with trichomes 0.4–0.8 mm long, these adaxially a little smaller. **Segments** perpendicular to the rachis, the base usually expanded symmetrically or, if sometimes asymmetrical then the basiscopic edge perpendicular to the rachis, the costae decurrent on the rachis, the costae, veins and laminar tissue conspicuously pilose with trichomes 0.2–0.5 mm long. **Veins** indistinct to obscure, 1–2-forked, free to partly anastomosing. **Sori** medial to supramedial. **Sporangia** with 1–3, often deciduous, capsular setae.

Of the four varieties recognized by Evans (1969) only var. *macedoi* (Bolivia and southern Brazil) does not occur in Peru. The latter is distinguished by forked laminar trichomes and fully anastomosing veins. The other varieties have simple trichomes, and veins are free to only partly anastomosing.

Key to Varieties

- a. Leaves 16–30 cm long; petiole 2–5(–7) cm long; veins 1-forked, free 9c. var. **abbreviata**
- a. Leaves 30–150 cm long; petiole 6–20 cm long; veins 2-forked, partly anastomosing b
- b. Trichomes of rachis, costae, and laminar surface copious, all about the same density and length (ca. 0.5 mm) 9a. var. **camptophyllaria**
- b. Trichomes of rachis and costae moderate and to 0.8 mm long, noticeably longer and much more abundant than those of the laminar tissue 9b. var. **lachnifera**

9a. *Pecluma camptophyllaria* var. *camptophyllaria*.

Polypodium camptophyllum Fée, Mém. foug. 8: 86. 1857. TYPE: Colombia, north of Santander, near Ocaña. *Schlim* 128 (holotype, P!; isotypes, BR, G, K!; photos, F of P, US of K).

In forests, on trees or rocks, or on the wet forest floor, 1800–3200 m, San Martín, Huánuco, Junín, Apurímac to Puno.

Costa Rica and Panama; Greater Antilles; Colombia and Venezuela to Bolivia and Brazil.

This variety is distinguished by the dense and evenly disposed trichomes of the axes and lamina. It and the conspicuously smaller var. *abbreviata* are sparsely represented in scattered locations in Peru, whereas var. *lachnifera* is far more common and widespread. Trichomes of the latter are coarse, of moderate abundance and of irregular length, often to 0.8 mm on rachis and costa, but half as long and much more scattered on the laminar tissue.

San Martín: Dist. Huallaga, valley of Río Apisoncho, *Hamilton & Holligan* 910 (US). **Huánuco:** Hwy. from Chinchao to Durand, *Coronado* 91 (UC, US). Muña, *Woytkowski* 5238 (GH, MO). **Junín:** Yaupe, *Woytkowski* 6489 (MO). **Apurímac:** Chirhuai, Quebrada Matará, *Vargas* 2299 (GH). **Cuzco:** Urubamba River, Machu Picchu, *Heller* 2206 (US), *Herrera* 3479 (US). **Puno:** Prov. Sandia, near Sandia, *Vargas* 14806 (GH).

9b. *Pecluma camptophyllaria* var. *lachnifera* (Hieron.) Lell., Amer. Fern J. 74: 59. 1984.

Polypodium camptophyllum var. *lachniferum* (Hieron.) Evans, Ann. Missouri Bot. Gard. 55: 254. 1969.

Polypodium lachniferum Hieron., Bot. Jahrb. Syst. 34: 515. 1904. LECTOTYPE (designated by Evans, 1969): Ecuador, Mt. Tungurahua, *Lehmann* 458 (B; isoelectotypes, LE, US!).

In forests, clearings, and wooded canyons, on trees, rocks, or rocky slopes, 1000–2900 m, Cajamarca and Amazonas south to Ayacucho and Puno.

Cuba and Jamaica; Venezuela; Colombia to Bolivia.

Cajamarca: Prov. Cutervo, Cutervo-Sócota, *López & Sagástegui* 5333 (GH, HUT, MO); Prov. Celendín, Cantange, *Sagástegui et al.* 8448 (F, HUT, MO, UC). **Amazonas:** Prov. Chachapoyas, road Palmira–Leimebamba, *Fernandez* 78 (NY, USM). Prov. Chachapoyas, Cerros Calla Calla, San Miguel, *Hutchison & Bennett* 4544 (F, GH, UC, US). **Huánuco:** Muña, *Macbride* 3968 (F, US), *Woytkowski* 5217 (GH, MO). **Pasco:** Prov. and Dist. Oxapampa, Río San Alberto, *Foster et al.* 10284 (F). **Junín:** Prov. Tarma, 5 km SW of Huacapistana, *Tryon & Tryon* 5426 (GH, US). **Ayacucho:** Ccarrapa, between Huanta and Río Apurímac, *Killip & Smith* 22473 (US). **Cuzco:** Quillabamba, Santa Teresa, Mandornilloc, *Peyton & Peyton* 1276 (GH). **Puno:** Prov. Sandia near Sandia, *Soukup & López* 14762 (GH).

9c. *Pecluma camptophyllaria* var. *abbreviata* (Evans) Stolze, comb. nov.

Polypodium camptophyllum var. *abbreviatum* Evans, Ann. Missouri Bot. Gard. 55: 256. 1969. TYPE: Peru, Cuzco, Prov. La Convención, Dist. Santa Ana, Hacienda Echarabi, *Herrera* 872 (holotype, US!).

In forests or in clearings, or rocks or rocky slopes, 1300–2900 m, Cajamarca, Huancavelica, and Cuzco.

Endemic.

Cajamarca: Prov. Celendín. Canyon of Río Marañón above Balsas, *Hutchison & Wright* 5324 (F in part, GH in part, MO, US). **Huancavelica:** Prov. Tayacaja, *Tovar* 2015 (GH), 3701 (GH). **Cuzco:** “Pampakjahue,” *Coronado* 105 (UC, US). 20 km N of Ollantaytambo, *Hutchcock* 22516 (US). Urubamba Valley, *León* 442 (F, USM).

10. *Pecluma ptilodon* (Kunze) Price, Amer. Fern J. 73: 115. 1983.

Plants epiphytic or terrestrial. Stem long- or short-creeping, the scales narrow-deltate, attenuate, light to reddish brown, 2–4 mm long. Leaves 25–150 cm long, crowded to fasciculate. Petiole 1–35 cm long, reddish brown. Lamina firm-herbaceous to subcoriaceous, to 20 cm broad, elliptic

to narrow-ovate, abruptly or very gradually reduced at base to mere lobes or auricles. **Rachis** reddish brown, scales lacking or rare and filiform, sparsely to abundantly pilose with acicular trichomes 0.2–1.5 mm long, or these a little shorter adaxially. **Segments** perpendicular to the rachis, the base (in varieties occurring in Peru) expanded symmetrically, the margins with ample, minute trichomes, the costae (in Peru) perpendicular to the rachis and glabrous or sparsely to amply puberulent or pilose. **Veins** distinct or obscure, 1–3-forked, free, glabrous or with a few, scattered, acicular trichomes. **Sori** medial. **Sporangia** with 1–3 setae.

Key to Varieties

- a. Petiole 8–20 cm long; lamina subtruncate at base, abruptly reduced to a few small lobes or auricles; rachis trichomes 0.2–0.3 mm long 10a. var. **ptilodon**
- a. Petiole 1–3(–8) cm long; lamina attenuate at base, many segments very gradually reduced to auricles; rachis trichomes (at least abaxially) to 1.5 mm long 10b. var. **pilosa**

10a. *Pecluma ptilodon* var. *ptilodon*.

Polypodium ptilodon Kunze, Linnaea 9: 42. 1834 (as "ptiloton"). TYPE: Peru, San Martín Pampayacu, Poeppig in July 1829 (holotype, LZ, destroyed; isotype, B!, designated as lectotype by Evans, 1969; photo, F of B).

In dense forests, 1000–1700 m, San Martín, Huánuco, and Junín.

Peru; Bolivia.

Huánuco: Prov. Huánuco, Dist. Churubamba, Cotirarda, *Mexia* 8220a (GH, UC). Prov. Huánuco, Puente Durand, *Stork & Horton* 9571 (UC). **Junín:** Schunke Hacienda, above San Ramón, *C. Schunke A-151* (US). La Merced, Chanchamayo, *C. Schunke* 23 (GH, UC, US). Chanchamayo Valley, *C. Schunke* 126 (US).

10b. *Pecluma ptilodon* var. *pilosa* (Evans) Stolze, *comb. nov.*

Polypodium ptilodon var. *pilosum* Evans, Ann. Missouri Bot. Gard. 55: 259. 1969. TYPE: British Guiana (Guyana), Demerara, Essequibo River, *Jenman* (NY).

On trees in forests, 130–1100 m. Amazonas to Cuzco and Madre de Dios.

Trinidad: Guyana; Venezuela; Peru; Bolivia; Brazil.

Amazonas: Prov. Bagua, Cerro Tapur on Río Utcubamba, *Hutchison* 1470 (GH, UC). **San Martín:** San Mar-

The species occurs in the United States (Florida); Greater Antilles; Mexico to Honduras; South America.

Four varieties were recognized by Evans (1969). Variety *robusta* (Fée) Lell. (southern South America) has the largest leaves, with the basiscopic base of segments perpendicular to the rachis at least in the proximal half of the lamina. In the other varieties, segment bases are subequally expanded on both edges. Variety *caespitosa* (Jenm.) Lell. (Florida, West Indies, Mexico to Honduras) is supposedly distinguished from var. *ptilodon* in subtle differences in length of leaf, petiole, and spores. The other two varieties occur in Peru.

tín, km 28 of Tarapota–Yurimaguas Road, *Knapp & Mallet* 8373 (MO). **Loreto:** Prov. Maynas, Yanamono Tourist Camp, *van der Werff et al.* 9890 (MO, UC). **Huánuco** (as San Martín): 10 km from Tingo María on road to Lima, *Allard* 21541 (US). Prov. Huánuco, Tingo María, along Río Huallaga, *Tryon & Tryon* 5334 (GH, US). **Pasco** (as Junín): Pichis Trail, Santa Rosa, *Killip & Smith* 26201 (US). Prov. Oxapampa, Quebrada Castilla, on Río Omaiz, *León & Young* 1066 (USM). **Ucayali** (as Loreto): Coronel Portillo, Pucallpa–Lima Hy., *McDaniel* 13963 (GH). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, Río Tono, *Wachter et al.* 181 (F). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, Río Palotoa, *Foster et al.* 10716 (F).

11. *Pecluma hygrometrica* (Splitg.) Price, Amer. Fern J. 73: 115. 1983. **Figure 6a.**

Polypodium hygrometricum Splitg., Tijdschr. Natuurl. Gesch. Physiol. 7: 409. 1840. TYPE: Surinam, Para, *Splitgerber* 1069 (holotype, L, isotype, US; photo, US of L).

Plants epiphytic or epipetric. **Stem** short- to long-creeping, the scales linear to narrow-deltate, acuminate or attenuate, orange to reddish brown, 2–4 mm long, entire to remotely and inconspicuously papillate or denticulate. **Leaves** 27–40(–50) cm long, approximate. **Petiole** 5–12 cm long, reddish brown. **Lamina** narrow- or ovate-deltate, 6–10 (–12) cm broad, truncate or occasionally a few proximal segments slightly reduced. **Rachis** reddish brown, scales lacking or inconspicuous and filiform, amply but minutely pilose with silvery

trichomes abaxially. **Segments** perpendicular to the rachis, lamina tissue silver-pilose on both sides, the costa decurrent on the rachis. **Veins** usually obscure, 1(–2)-forked. **Sori** mostly medial. **Sporangia** setose, the setae often deciduous at maturity.

In montane or lowland forests, on trees or rocks, 100–3200 m, Loreto, Junín, Cuzco, and Madre de Dios.

Mexico to Panama: Guyana to Colombia, south to Bolivia.

In addition to the characters used in the key, this can be further distinguished from *P. divaricata* by the smaller leaves that are more crowded on the stem and by the amply but minutely silver-pilose lamina tissue abaxially. The laminar tissue in *P. divaricata* is glabrous or sparsely provided with minute, brownish trichomes.

Loreto: Prov. Maynas, 50 mi downriver from Iquitos, *Moran 3655* (F, MO). Lower Río Huallaga basin between Yurimaguas and Balsapuerto, *Killip & Smith 28164* (F, US). **Junín:** Río Pinedo, N of La Merced, *Killip & Smith 23608* (US). Prov. Satipo, road to La Merced, *León 184* (F). **Cuzco:** Prov. Calca, Lares, *Marín 2309* (F). **Madre de Dios:** Parque Nacional de Manú, Cocha Cashu Station, *M. Foster P-84-2* (UC).

Comments

Pecluma dispersa (Evans) Price, *Amer. Fern J.* 73: 114. 1983.

Polypodium dispersum Evans, *Ann. Missouri Bot. Gard.* 55: 235. 1969. TYPE: United States, Florida, Citrus County, Pineola Grottoes, *Evans 2008* (holotype, MICH; isotypes, TENN, US!).

Although this species has been cited by Evans as occurring throughout the Neotropics, including Ecuador, Brazil, and Bolivia, it has not yet been found in Peru. It scarcely differs from *P. plumula*, under which may be seen further discussion.

Polypodium lomariiforme Kunze, *Linnaea* 9: 42. 1834. TYPE: Peru (Huánuco), dry mountains of Cassapi, *Poeppig* in 1829, *Diar.* 1152 (not located).

Kunze's description is insufficient to place this name, and the type has not been located. The description, insofar as it goes, seems to agree with that of *Pecluma camptophyllaria* var. *lachnifera*. If this is correct, the name of *Polypodium loma-*

riiforme would have priority as a species, but without examining the type, nothing further can be determined. For further discussion of the question, see Evans (1969, p. 265).

III. Polypodium

Polypodium L., *Sp. pl.* 1082. 1753; *Gen. Pl.* ed. 5, 485. 1754. TYPE: *Polypodium vulgare* L. **Figure 7.**

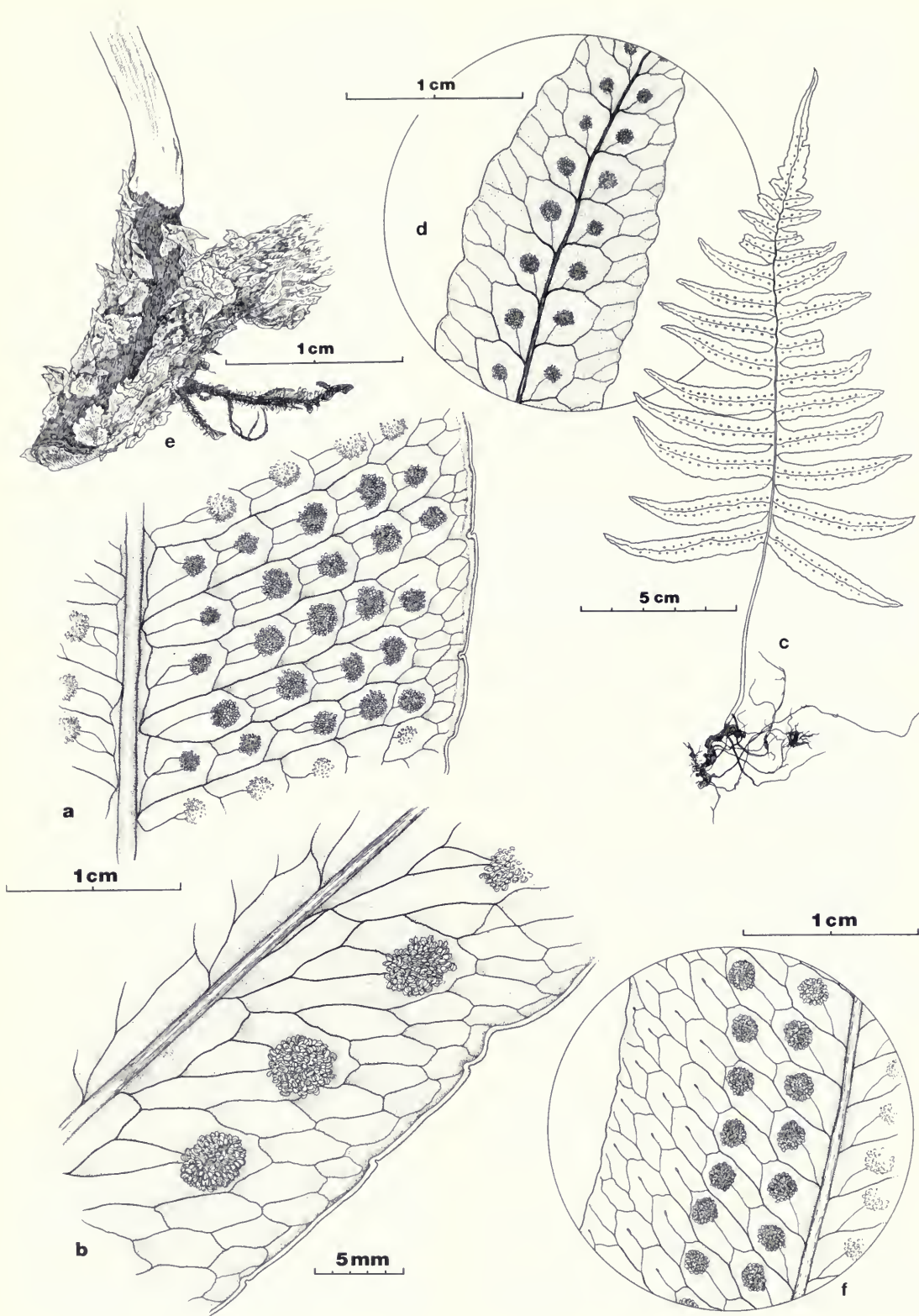
Marginaria Bory, *Dict. Class. d'Hist. Nat.* 6: 587. 1824. Species listed in 10: 176. 1826. TYPE: *Marginaria polypodioides* (L.) Tidestr. (*Acrostichum polypodioides* L.) = *Polypodium polypodioides* (L.) Watt.

Phlebodium (R. Br.) John Sm., *J. Bot. (Hooker)* 4: 58. July 1841. *Polypodium* section *Phlebodium* R. Br., *Pl. Jav. Rar.* (Bennett & Brown; Horsfield) 4. 1838. TYPE: *Polypodium aureum* L. (*Phlebodium aureum* (L.) John Sm.).

Lepicystis (John Sm.) John Sm., *London J. Bot.* 1: 195. 1842. *Goniophlebium* section *Lepicystis* John Sm., *J. Bot. (Hooker)* 4: 56. 1841. TYPE: *Goniophlebium incanum* John Sm. *Polypodium incanum* Sw., *nom. superfl.* (*Lepicystis incana* John Sm., *nom. nud.*) = *Polypodium polypodioides* (L.) Watt.

Terrestrial, rupestral or epiphytic. **Stem** short-to long-creeping (to 5 m or more), moderately stout to slender, bearing peltate-based scales. **Petiole** articulate. **Leaves** monomorphic to somewhat dimorphic (the fertile longer than the sterile), borne in a cluster to widely spaced. **Lamina** pinnatifid, pinnatisect, or 1-pinnate, rarely to 2-pinnate-pinnatifid or 3-pinnate, or (in *P. laevigatum*) entire, glabrous, pubescent, or sparsely to densely scaly. **Veins** free to anastomosing with or without free included veinlets. **Sori** round or roundish, borne at the tip of a vein, rarely back of the vein tip, or at the junction of veins, on a usually slightly to moderately raised receptacle, paraphysate or not, exindusiate. **Spores** ellipsoidal, monolete, the laesura $\frac{1}{2}$ – $\frac{2}{3}$ the length, often with a low, verrucate, tuberculate, or papillate surface, sometimes with more or less winglike folds.

The leaves of *Polypodium* are articulate, leaving a clean scar above the base of the petiole. The petiole below the scar is sometimes called a phyllopodium. The veins may be free or variously anastomosing and the sori are borne at the tip of a veinlet, rarely back of the vein tip, or at the junction of veins. Paraphyses are not conspicuous in *Polypodium*. They are usually filamentous,



sometimes branched, or they may be expanded at the apex, or they may resemble sporangia. Some species such as *Polypodium pycnocarpum* have the immature sori covered by scales. These are not considered to be paraphyses because they are attached at the periphery of the receptacle rather than on the receptacle. Nectaries may be present in several species of *Polypodium*—for example, in *P. thyssanolepis* (Koptur et al., 1982). A dark-colored sheath around each meristele is reported for *P. loriceum*, *P. subandinum*, *P. dasyleuron*, *P. fraxinifolium*, *P. adnatum*, *P. caceresii*, and *P. laevigatum* and sometimes in *P. lasioipus* (Hensen, 1990).

In the key and descriptions, the term pinna is used for a primary segment that is sessile or stalked. The term pinna-segment is used for a primary segment that is adnate to the rachis or basally joined to other primary segments (the lamina pinnatifid).

There are many problems in this genus that can

only be resolved by an adequate monographic treatment of the Andean species.

References

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Key to Species of *Polypodium*

- a. Lamina irregularly lobed or pinnatifid, at least in part two hybrids, see **Comments**.
- a. Lamina simple and entire, the margins even or essentially so; stem very slender and long-creeping; scales at the apex of the stem obtuse **12. P. laevigatum**
- a. Lamina regularly deeply pinnatifid or 1–3-pinnate **b**
 - b. Sorus often at the junction of 2 or 3 veins; scales of the stem apex reddish brown to light brown, elongate, concolorous, not clathrate; lamina margin cartilaginous, usually notched. **c**
 - c. Sori in 1 or 2 rows between the costa and the margin; lamina often glaucous abaxially; primary lateral veins absent or not prominent abaxially where all veins are equally prominent or nearly so **13. P. aureum**
 - c. Sori in 4 to 6 rows between the costa and the margin; lamina light green abaxially; primary lateral veins prominently raised or abaxially rather so **14. P. decumanum**
 - b. Most or all sori on 1 vein; scales of the stem apex brown, or darker **d**
 - d. Lamina 2-pinnate-pinnatifid to 3-pinnate at the base **23. P. monosorum**
 - d. Lamina deeply pinnatifid to 1-pinnate-pinnatifid **e**
 - e. Sori in 3 or more rows between the costa and the margin or predominantly so **f**
 - f. Primary lateral veins connected by obvious transverse veins, these forming several areolae between the costa and the margin; areolae mostly with 2–4 sori between adjacent transverse veins **9. P. fendleri**
 - f. Transverse secondary veins evident, obscure, or absent; areolae with 1 sorus between transverse veins **g**
 - g. Scales of the stem apex dull or shining, not iridescent **h**
 - h. Scales of the stem apex obtuse to acute, rarely acuminate; scales mostly appressed to the stem; stem long-creeping **8. P. fraxinifolium**
 - h. Scales of the stem apex acuminate to attenuate, sometimes with a filiform tip **i**

FIG. 7. *Polypodium decumanum*: **a**, portion of fertile pinna. *Polypodium aureum*: **b**, portion of fertile pinna. *Polypodium loriceum*: **c**, habit; **d**, portion of fertile pinna; **e**, petiole base and part of stem. *Polypodium triseriale*: **f**, portion of fertile pinna. (Adapted from Stolze, Ferns and Fern Allies of Guatemala, 1981.)

- i. Pinnae, pinna-segments, and rachis glabrous; scales of the stem apex acuminate to long-acuminate; stem short-creeping, proximal pinnae usually sessile to slightly adnate 7. **P. triseriale**
 - i. Pinna-segments and rachis pubescent (may be slightly so) adaxially and abaxially, or at least the segments pubescent on the costa and margins; scales of the stem apex with a filiform tip; stem long-creeping and proximal pinnae somewhat adnate 10. **P. adnatum**
 - g. Scales of the stem apex iridescent, spreading, light brown to brown, or rarely blackish, the cell walls thin, many of the scales, especially of the stem apex, with a long, filiform tip; distal pinnae sessile or slightly adnate 11. **P. caceresii**
- e. Sori in 1 or 2 rows between the costa and the margin, or predominantly so j
- j. Pinnae and pinna-segments with scales few or lacking abaxially, veins readily visible because they are raised, or the tissue thin and the veins readily visible with transmitted light k
- k. Scales of the stem apex concolorous, uniformly colored l
 - l. Veins free or a few casual anastomoses present 1. **P. sororium**
 - l. Veins regularly anastomosing, at least along the costa m
 - m. Stem very slender, lamina pinnatisect, proximal pinna-segments fully adnate; stem apex scales dark brown, hardly clathrate, narrow ... 4. **P. subandinum**
 - m. Stem rather stout, lamina rarely pinnatisect, usually 1-pinnate; proximal pinna-segments short-stalked to sessile or slightly adnate; stem apex scales brownish, clathrate, broad 6. **P. sessilifolium**
- k. Scales of the stem apex more or less bicolorous, with a darker center and lighter, thinner margins; the stem and apex sometimes nearly devoid of scales n
- n. Pinnae mostly or all sessile, or if pinna-segments adnate, then these broadest at about the center o
 - o. Distal pinna-segments adnate; scales of the stem apex acuminate to attenuate; stem short-creeping 7. **P. triseriale**
 - o. Distal pinnae sessile or only slightly adnate; scales of the stem apex obtuse to acute; scales mostly appressed to the stem; stem long-creeping 8. **P. fraxinifolium**
- n. Pinna-segments mostly or all fully adnate to the rachis and usually broadest there p
 - p. Scales of the stem apex and the stem roundish, usually few except at the apex; stem very long-creeping; rachis and costae long-pubescent, especially abaxially 5. **P. dasyleuron**
 - p. Scales of the stem apex and stem obtuse to acuminate; stem short- to long-creeping; rachis and costae glabrous to short-pubescent q
 - q. Stem very long-creeping, often with deciduous scales; lamina rarely short-pubescent and slightly so; veins regularly anastomosing; 1 or 2 rows of sori between the costa and the margin; not on lomas 2. **P. loriceum**
 - q. Stem short- to rather long-creeping, densely covered by persistent scales; lamina, especially the rachis, glandular-short-pubescent; veins often free distally, or all veins free; 1 row of sori between the costa and the margin; sometimes on lomas 3. **P. lasiopus**
- j. Pinnae and pinna-segments densely covered with scales, or the tissue thick and the veins not visible with transmitted light r
- r. Lamina gradually reduced at the base to small, often auriculiform lobes s
 - s. Pinna-segments abundantly scaly abaxially, the scales reddish brown 21. **P. bombycinum**
 - s. Pinna-segments sparingly scaly abaxially, the scales whitish .. 22. **P. balaonense**
- r. Lamina not or hardly reduced at the base t
 - t. Scales of the stem apex concolorous u

- u. Stem short-creeping, the leaves and phyllopodia approximate; pinna-segments abaxially densely scaly with whitish scales; veins free ... 17. **P. furfuraceum**
- u. Stem long-creeping, leaves and phyllopodia distant; pinna-segments abaxially more or less scaly, with dark brown scales or the scales with a dark brown center; veins anastomosing 19. **P. megalolepis**
- t. Scales of the stem bicolorous, with a dark center and lighter margins v
- v. Scales of the stem apex in mass appearing woolly with projecting dark spines, many scales with a narrow, thick, blackish projecting center and thin, broad margins; leaves usually dimorphic, the fertile often taller than the sterile 16. **P. remotum**
- v. Scales of the stem apex closely appressed to spreading, the tip attenuate to filiform, the darker center not projecting, the tips brown or lighter, the lighter margins narrow to moderately broad w
- w. Stem very slender, ca. 1 mm wide dry; sori immersed in the leaf tissue; veins anastomosing, at least in part 18. **P. polypodioides**
- w. Stem stouter, ca. 2 mm or more wide dry; sori superficial; veins free or anastomosing x
- x. Margin of the pinna-segments notched, especially distally; adaxial side of the pinna-segments glabrous; veins free 15. **P. pycnocarpum**
- x. Margin of the pinna-segments entire, not notched; adaxial side of the pinna-segments scaly, rarely glabrous; veins anastomosing 20. **P. thysanolepis**

1. **Polypodium sororium** Willd., Sp. pl. ed. 4, 5: 191. 1910. TYPE: Venezuela, "Prope Caripe," *Humboldt* 424 (holotype, B!, *Herb. Willd.* 19684, sheets 1 and 2; photos, GH).

Stem short- to long-creeping, leaves approximate to distant. **Scales** of stem apex light brown to reddish brown, not iridescent, not clathrate, appressed, the apex acuminate to mostly filiform. **Lamina** pinnatisect to 1-pinnate, to ca. 100 cm long, monomorphic, usually only somewhat reduced at the base. **Pinnae** or **pinna-segments** glabrous or somewhat scaly or short-pubescent abaxially, the margins notched or not, the distal ones adnate at the base and margins notched or not, the distal ones adnate at the base and broadest there, the proximal ones sessile to adnate. **Veins** free, 2–3-forked, visible. **Sorus** at the end of a vein, 1 row of sori between the costa and margin.

In forests, terrestrial (one collection epiphytic), 350–1500 m, San Martín, Huánuco, and Pasco.

Mexico and Central America; West Indies; northern South America; Colombia south to Peru.

This free-veined species has commonly been called *P. dissimile* L. However, according to Lellinger (*Amer. Fern J.* 70: 30. 1980) that species has anastomosing veins and is the correct name for what has usually been called *P. chnoodes* Sprengel. The earliest name for the present species is *P. sororium* Willd.

San Martín: Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke* V. 6944 (MO). **Huánuco:** Sinchono, *Aguilar* 879 (USM). **Pasco:** San Nicolás, Pichis Trail, *Killip & Smith* 260122 (US, USM).

2. **Polypodium loriceum** L., Sp. pl. 2: 1086. 1753. LECTOTYPE (by Proctor, *Ferns of Jamaica*, 529. 1985): Petiver, *Pterigraph. Amer.*, t. 7, f. 10 (redrawn from Plumier, *Traité Foug. Amér.*, t. 78), from Martinique. **Figures** 7c–e.

Polypodium latipes Langsd. & Fisch., Pl. voy. Russes monde (Icon. fil.) 1: 10, t. 10. 1810. TYPE: Brazil, "Insula St. Catharina," *Langsdorff* (holotype, LE).

Polypodium laetum Raddi, Opusc. Sci. 3: 287. 1819. TYPE: Brazil, *Raddi* (holotype, F), not Salisb. Prod. 403. 1796.

Polypodium chartaceum Baker, J. Bot. 15: 166. 1877. TYPE: Ecuador, Andes of Quito, Volcán el Corazón, 3200–3400 m, *Sodiño* (holotype, K; frag. and photo, US!).

Stem long-creeping, the leaves mostly distant, scales appressed or sometimes spreading, or the stem naked. **Scales** of the stem apex bicolorous, brown, dark in the center where clathrate (the cell walls thicker), the margins thin, lighter in color, not iridescent, apex obtuse to acuminate. **Lamina** pinnatisect, to ca. 80 cm long, monomorphic, not reduced at the base or slightly so. **Pinna-segments** adnate, broadest at the base, the margin smooth (not notched), or slightly so (crenulate), especially

toward the apex, glabrous abaxially or slightly scaly, or short- to long-pubescent. **Veins** visible, anastomosing, at least along the costa or a few free. **Sorus** at the end of a vein, 1–2 rows of sori between the costa and margin.

Epiphytic or rarely terrestrial, 300–3300 m, usually ca. 2000 m, Amazonas to Cuzco and Madre de Dios.

Mexico and West Indies; Central America; Venezuela and Colombia; south to Argentina; east to southeastern Brazil.

Polypodium laetum Raddi of southeastern Brazil is close to or the same as *P. loriceum*, its characters falling within the variation of that species at least when interpreted broadly. *Polypodium latipes* is a less certain synonym. Hensen (1990) treated it as a widespread species (including Peru), whereas Sehnem (Fl. Illust. Catar. Polypodiaceae) restricted its range to southeast Brazil and British Guiana.

Amazonas: Serrania de Bagua, *Gentry et al.* 23060 (F, UC). Prov. Chachapoyas, Quebrada Molino, *Wurdack* 765 (GH, US). **San Martín:** Prov. Rioja, Pedro Ruiz-Moyobamba, *D. Smith* 4414 (MO, USM). Prov. Mariscal Cáceres, Dist. Tocache Nuevo, *J. Schenke* V. 4656 (US). **Huánuco:** Tingo María (as San Martín), *Allard* 22300 (GH). Río Llullapichis watershed, ascent of Cerros del Sira, *Dudley* 13372 (GH, MO, US), 13560 (GH). Prov. Huánuco, Chinachao, *Ferreira* 16981 (GH, US, USM). **Pasco:** Oxapampa (as Junín), *Soukup* 2365 (GH, US), 3358 (GH, US). **Junín:** Huacapistana, *Killip & Smith* 24499 (F, GH, US). La Merced, *Soukup* 1086 (F). **Ucayali:** Prov. Coronel Portillo, Aguaytia, *J. Schunke* V. 5457 (F, US). **Ayacucho:** Prov. La Mar, Cordillera Central, *Dudley* 12029 (GH). **Cuzco:** Prov. Urubamba, Machu Picchu, *Peyton & Peyton* 1300 (GH, MO); Prov. La Convención, Huayopata, *Peyton & Peyton* 1389 (GH, MO). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al.* 10685 (F), 10753 (F).

3. *Polypodium lasiopus* Klotzsch, *Linnaea* 20: 393. 1847. TYPE: Venezuela, Colonia Tovar, *Moritz* 256 (holotype, B; isotypes, BM, P.).

Polypodium pubescens Hooker & Grev., *Icon. fil.*, t. 182. 1830, not L. 1759. TYPE: Argentina, Cerro del Morro, San Luis, *Gillies* (holotype, K).

Polypodium gilliesii C. Chr., *Ind. fil.* 529. 1906. *nom. nov.* for *Polypodium pubescens* Hooker & Grev., not L., 1759, and with the same type.

Polypodium lasiopus f. *bipinnatifidum* Kunkel, *Nova Hedwigia* 3: 379. 1961. TYPE: Chamiseria, “bei Huancayo,” Peru, *Kunkel* (holotype, *Herb. Kunkel*).

Polypodium lasiopus var. *weberbauerianum* Kunkel, *Nova Hedwigia* 3: 380. 1961. Chamiseria, “bei Huancayo,” Peru, *Kunkel* (holotype, herb. not given).

Stem somewhat short- to moderately long-creeping, leaves distant or usually rather approximate, the scales appressed or the tips spreading. **Scales** of the stem apex brown, bicolorous, dark brown in the center where clathrate, and cell walls thick, apex of scales acuminate to somewhat filiform, not iridescent. **Lamina** pinnatisect or rarely the pinna-segments pinnatifid, to ca. 20 cm long, monomorphic, not reduced at the base or rarely so. **Pinna-segments** adnate or the proximal ones sessile or slightly adnate, broadest at the base, scales few or none, pubescent abaxially or not, rachis the same, usually short, glandular-pubescent, rarely long-pubescent. **Veins** visible, free or anastomosing. **Sorus** at the tip of a vein, sori in 1 row between costa and margin.

Terrestrial or rarely (especially on lomas) epiphytic, often among rocks or on cliffs and ledges in forests on stream banks, sometimes on limestone, 400–3600 m, usually above 2000 m except lower on lomas; Lambayeque to Cuzco.

Andean South America; range uncertain.

Lambayeque: Prov. Chiclayo, Cerro Reque, *Llatas* 340 (GH, HUT, MO). Prov. Lambayeque, Entre Beatita de Huay y km 38, *López et al.* 4043 (GH, HUT). **Cajamarca:** Between Llacanora and Namora, *Correll & Smith* P882 (GH, MO). Prov. Contumazá, Pampa de Guzmango, *Sagástegui* 11440 (F, GH, MO). **La Libertad:** Prov. Trujillo, Cerro Campana, *Sagástegui & Kobats* 9213 (F, MO). *Sagástegui et al.* 12956 (F, GH, MO). **Ancash:** Lomas de Lupín, *Velarde* 4441 (GH). **Huánuco:** Mito, *Macbride & Featherstone* 1707 (F), *Bryan* 194 (F). Muña, *Bryan* 418 (F). **Lima:** Loma de Lachay (Luchay), *Tryon & Tryon* 5418 (F, GH, US), *Ferreira* 197 (USM). Atacongo Lomas, *Stork et al.* 9283 (GH, US). Lomas de Granados, *Stork & Vargas* 9338 (GH, US). **Junín:** Huancayo, *Soukup* 2966 (F). Prov. Tarma, Huacapistana, *Tryon & Tryon* 5455 (GH, US). Mato ad Yaupi, *Woytkowski* 6543 (MO, US). **Ayacucho:** Pampalca, between Huanta and Río Apurímac, *Killip & Smith* 22263 (GH, US). **Cuzco:** Urubamba Valley, *León* 447 (F, USM).

4. *Polypodium subandinum* Sodiro, *Crypt. vasc. Quit.* 348. 1893. TYPE: “Corazón, Paschocha, Pichincha, etc.,” 3000–3500 m, Ecuador, *Sodiro* (holotype, ?).

Stem very slender and long-creeping, more or less naked or somewhat scaly, the scales mostly appressed with their tips spreading. **Scales** of the stem apex hardly clathrate, dark brown, concolorous, not iridescent, the apex attenuate to filiform. **Lamina** pinnatisect, to ca. 20 cm long, monomorphic, not reduced at the base, or only slightly so. **Pinna-segments** adnate, broadest at the

base, margins smooth, rather sparingly to densely long-pubescent abaxially, the rachis similar. **Veins** visible, anastomosing at least along the costa. **Sorus** at the end of a vein, 1 row of sori between costa and margin.

Terrestrial, in forests, 200–3000 m, Amazonas, San Martín, and Pasco.

Andes; range uncertain.

The pubescence on the abaxial surface of the pinna-segments may be similar to that of *P. lasiopus* and *P. dasyleuron*. However, the stem is very slender and the scales of the stem apex are narrow and concolorous.

Amazonas: Prov. Chachapoyas, Cerros Calla Calla, 18 km above Leimebamaba on road to Balsas, *Hutchison & Wright 4872* (F, GH). **San Martín:** Dist. Huallaga, *Hamilton & Holligan 1202* (us). **Pasco:** Pichis Trail, San Nicholas to Azupizú, *Killip & Smith 26098* (us).

5. *Polypodium dasyleuron* Kunze, Linnaea 9: 43. 1834. TYPE: Peru, Pampayaco (Pampayacu), *Poeppig, Diar. 1111* (holotype, LZ, destroyed; isotype, ? *Poeppig* in 1829, K; frag. us!).

Stem long-creeping, leaves distant, scales usually lacking, or a few appressed ones present. **Scales** of the stem apex mostly few, clathrate in the center where the cell walls are thicker, margins lighter, narrow, not iridescent, apex obtuse. **Lamina** to 50 cm long, pinnatisect, monomorphic, slightly reduced at the base, or not. **Pinna-segments** adnate, broadest at the base, margins smooth (not notched), sparsely to rather densely long-pubescent, especially on the costa abaxially, hardly scaly. **Veins** readily visible, anastomosing at least along the costa, some veins may be free. **Sorus** at tip of a vein, 1 row of sori between the costa and the margin.

Epiphytic, rarely on rotten wood, in dense forests, rarely in inundated forests, 200–1800 m, Amazonas and Loreto to Madre de Dios and Cuzco.

Costa Rica south to Peru.

San Martín: Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke V. 4656* (F, MO, USM); 6942 (F, MO). **Loreto:** Above Pongo de Manseriche, *Mexia 6142* (F, GH, MO, US). **Valencia,** Río Corrientes near Platanoyacu, *McDaniel and Marcos 11162* (F, GH, MO). **Huánuco:** Tingo María, *Tryon & Tryon 5284* (F, GH, US, USM). **Pasco:** Prov. Oxapampa, vicinity of Chequitavo, *D. Smith 5167* (MO). **Junín:** Chanchamayo Valley, *C. Schunke 127* (F). **Cuzco:** Prov. La Convención, above Hacienda Luisiana,

Davis et al. 1330 (F, GH). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al. 10715* (F).

6. *Polypodium sessilifolium* Desv., Mém. Soc. Linn. Paris 6: 238. 1827 TYPE: *Herb. Desvaux*, P; photo, us of P. (spelling corrected from on the label of the type, see Weath., Contr. Gray Herb. 114: 33. 1936).

Polypodium cordatum Kunze, Linnaea 9: 44. 1834. TYPE: "ad Cassapi," July 1829. *Poeppig (Diar. 1184)*, not Desv. 1827.

Polypodium surucuchense Hooker, Hooker's Icon. 1: t. 69. 1837. TYPE: Surucucho, near Cuenca "on trunks, Colombia" (Ecuador) *Jameson* (holotype, K).

Polypodium biauriculatum Hooker, Hooker's Icon. 2: t. 121. 1837. TYPE: Chachapoyas, Peru, *Mathews* in 1836 (holotype, K).

Polypodium chacapoyense Hooker, Sp. fil. 5: 29, t. 281. 1863. TYPE: Sesuja, Chachapoyas, Peru, *Mathews 3278* (holotype, K).

Polypodium kunzeanum C. Chr., Index fil. 536. 1906. Nom. nov. for *Polypodium cordatum* Kunze, not Desv.

Stem rather stout, short-creeping, and the leaves approximate to moderately long-creeping, leaves distant, the scales mostly spreading. **Scales** of the stem apex brownish, clathrate, concolorous, rarely iridescent, usually not so, the tip acute to somewhat filiform. **Lamina** pinnatisect to usually 1-pinnate, to ca. 100 cm long, monomorphic, not or hardly reduced at the base. The proximal **pinnae** or **pinna-segments**, sessile to short-stalked, the distal ones often slightly adnate to adnate, margins smooth, no scales abaxially or very few, essentially glabrous to usually short- to long-pubescent abaxially, and sparsely to definitely so. **Veins** visible, anastomosing at least along the costa. **Sorus** at the tip of a vein in 1 or 2 (rarely 3) rows between costa and margin.

Terrestrial or sometimes epiphytic, in rock crevices, on rocks or at the edge of rocks, in moist ravines, in thickets, at the edge of streams, in forests, 1300–4270 m, Piura south to Puno.

Tropical America; especially northern South America; range uncertain.

Piura: Prov. Huancabamba, Cerro La Viuda, *Sagástegui et al. 8208* (F, MO). **Cajamarca:** Prov. Cajamarca, Pampa de Guzmango, *Sagástegui 1440A* (F, MO). **Prov. Celendín,** Pumarrume, *Mostacero et al. 1030* (HUT, MO). **Amazonas:** Prov. Chachapoyas, Calla Calla slopes, *Wurdack 1755* (GH, US). **La Libertad:** Prov. Otuzco, Cerro Ragache, *Sagástegui et al. 11609* (F, MO). **Ancash:** Prov. Yungay, Laguna Llanganuco, *Sagástegui et al. 12318*

(GH, HUT, F). Prov. Recuay, Laguna de Quericocha, *López et al.* 7519 (GH, HUT). **Huánaco:** Muña, *Woytkowski* 5180 (GH, MO, US). **Junín:** Prov. Huancayo, 11 km from Huancayo toward Chameseria, *Saunders* 655 (F, GH, US). **Cuzco:** Prov. Urubamba, Machu Picchu, *Peyton & Peyton* 1041 (GH, MO). Prov. Quispicanchi, 10 km northeast of Marcapata, *Wasshausen & Encarnación* 767 (MO, USM). **Puno:** Prov. Caranaya, Ollachea, *Vargas* 6910 (MO, US).

7. ***Polypodium triseriale*** Sw., J. Bot. (Schrader) 1800(2): 126. 1801. TYPE: nothing cited. **Figure 7f.**

Polypodium longifolium Presl, Delic. prag. 1: 167. 1822. TYPE: "ad Rio Janeiro" (PR or PRC, not seen).

Polypodium preslianum Spreng., Syst. Veg. ed. 16, 5: 556 (index). 1828. *Nom. nov.* for *P. longifolium* Presl, 1822, not Cav. 1802.

Stem rather stout, short- to long-creeping, the leaves approximate to distant, scales more or less appressed. **Scales** of the stem apex large, with a brown to dark brown, clathrate center, and lighter brown, narrow margins, the apex acute to attenuate, slightly iridescent or not. **Lamina** pinnatisect distally or 1-pinnate proximally, to 90 cm long, monomorphic, not or hardly reduced at the base. **Pinna-segments** adnate to slightly so, the **pinnae** sessile, margins not notched, smooth, hardly pubescent or scaly abaxially. **Veins** visible, anastomosing. **Sorus** at the tip of a vein, sori in (1–)2–3 (rarely 4) rows between costa and margins.

Terrestrial or epiphytic, on or among rocks, in forests, 325–1900 m, probably higher; Tumbes and Amazonas to Cuzco.

Tropical America.

This is a variable species, especially in the number of rows of sori between the costa and margin. Some specimens seem to be intermediate with *P. fraxinifolium*.

Tumbes: Prov. Zarumilla, Arro de Tres Picos, *Simpson & Schunke* 379 (F). **Amazonas:** West of Molinopampa, *Wurdack* 1407 (F, GH, US). **Cajamarca:** Prov. Santa Cruz, Monteseco, *Sagástegui et al.* 12365 (F, MO). **San Martín:** Prov. Mariscal Cáceres, Pueblo Viejo de Tochache, *J. Schunke* V. 3718 (F, GH, US). Prov. Lamas, San Juan de Pacayzapa, *J. Schunke* 9543 (F, MO). **Loreto:** Río Tacsha Curaray, *Croat* 20458 (MO). **Huánuco:** East of Tingo María, *Croat* 21128 (MO). **Pasco:** Prov. Oxapampa, Palcazú Valley, *D. Smith* 3723 (MO). **Junín:** Huacapistana, *Coronado* 252 (GH). La Merced, *Soukup* 1094 (F). **Cuzco:** Prov. Paucartambo, Kosñipata, *Vargas* 11323 (GH). Prov. La Convención, Urusaiwa, *Vargas* 22347 (GH).

8. ***Polypodium fraxinifolium*** Jacq., Collectanea 3:

187. 1789. TYPE: "Cult. ex Caracas" (holotype, w) not Hooker, Sp. fil. 5: 4. 1863.

Polypodium appressum Copel., Univ. Calif., Publ. Bot. 10: 305. 1941. TYPE: Bolivia, Dept. La Paz, Prov. Sur Yungas, Colaya, *Mexia* 7812 (holotype, UC; isotype, GH!).

Stem long-creeping or rarely short-creeping, leaves distant, the scales appressed, roundish, or sometimes nearly naked. **Scales** of the stem apex bicolorous, with a dark brown to blackish, clathrate center and lighter, thinner margins, obtuse, rarely acuminate. **Lamina** 1-pinnate, to 75 cm long, monomorphic, not or hardly reduced at the base. **Pinnae** sessile or slightly adnate distally, sessile proximally, margins smooth, essentially glabrous abaxially, or rarely moderately pubescent. **Veins** visible, anastomosing. **Sorus** at tip of a vein; sori in 1 or 2, usually 3 (rarely 4 or 5), rows between costa and margin.

Terrestrial, epiphytic, rarely climbing on a tree trunk, or on rocks, in moist, shady places, in forests, 650–2700 m, Cajamarca to Puno.

Tropical America.

Cajamarca: Colasy, *Woytkowski* 7015 (GH, MO, US). Prov. Cutervo, San Andres, *Quiroz* 2720 (F). **Amazonas:** Prov. Chachapoyas, 5 km below Chachapoyas, *Wurdack* 629 (GH, US). Prov. Bagua, 12 km east of La Peca, *Barbour* 2589 (F, MO). **San Martín:** Prov. Rioja, Pedro Ruiz-Moyobamba, *D. Smith* 4362 (MO). Prov. Lamas, 4 km de San Juan de Pacayzapa, *J. Schunke* V. 6116 (F). **Loreto:** Sierra del Pongo, *Mexia* 6281 (GH, MO, US). **Huánuco:** Tingo María, *Aguilar* 310 (F, GH, US). **Pasco:** Oxapampa, *Soukup* 3353 (F, GH, US). **Junín:** Chanchamayo Valley, *C. Schunke* 77 (F), 794 (F). Above San Ramón, *Killip & Smith* 24704 (F). **Ucayali:** Prov. Coronel Pillo (as Loreto), entre Previsto y Boquerón, *Aguilar* 958 (F, GH). **Ayacucho:** Ayna, between Huanta and Río Apurímac, *Killip & Smith* 23180 (F, US). **Cuzco:** Prov. Urubamba, Machu Picchu, *Peyton & Peyton* 1394 (GH, MO). **Madre de Dios:** Prov. Manú, Carbon a Salvación, *Vargas* 16939 (GH, US). **Puno:** Prov. Carabaya, San Gaban (Gaban), *Vargas* 18915 (GH, US).

9. ***Polypodium fendleri*** D. C. Eaton, Mem. Amer. Acad., n.s., 8: 199. 1860. TYPE: Venezuela, *Fendler* 410 (holotype, YU; isotype, GH!).

Campyloneurum magnificum Moore, Index fil. 226. March 1861. TYPE: Venezuela, *Fendler* 410 (holotype, K?; isotype, GH!), *nom. nov.* for *Polypodium fendleri* D. C. Eaton, not *Campyloneurum fendleri* Moore.

Campyloneurum fendleri (D. C. Eaton) John Sm., Hist. fil. 97. 1875, not Moore, Index fil. 224, Oct. 1860.

Stem short- to long-creeping, leaves approximate or distant, scales appressed or spreading. **Scales** of the apex concolorous, brownish, clathrate, not iridescent, the apex acute to acuminate. **Lamina** to 80 cm long (or more), 1-pinnate glabrous or with a few scales abaxially, monomorphic, not reduced at the base, or slightly so. **Pinnae** 6–10 cm wide, sessile to slightly adnate, the margins smooth, not pubescent abaxially. **Veins** readily visible, anastomosing. **Sorus** at the end of a vein; sori in 11–15 rows between the costa and the margin, 2 or usually 3–4 between the main lateral veins.

Terrestrial or epiphytic, in dense forest, 1500–1800 m, San Martín, Junín and Pasco.

Panama; Venezuela and Columbia south to Bolivia.

This species is closely related to *Polypodium decurrens* Raddi but seems to be distinct due to a lack of intermediates. It is a larger species than *P. decurrens*, especially in characters of the stem diameter, leaf length, petiole diameter, and pinna width.

Polypodium fendleri and *P. decurrens* are both 1-pinnate species and have the sorus at the tip of a vein. These characters place the two species in the genus *Polypodium*. However, some authors prefer to place them in the genus *Campyloneurum* (Lellinger, Amer. Fern J. 78: 14–35. 1988). Moore (Index fil. lxxiv–lxxv) recognized that the terminal sori are exceptional in the genus *Campyloneurum* but considered that the venation was a more important character.

San Martín: Tarapoto, 4 mi E of Tarapoto, *Woytkowski* 35218 (MO, UC). **Pasco:** Oxapampa, Gran Pajonal, trail to Shumahuani from Chequitavo, *D. Smith* 5212 (MO). **Junín:** Above San Ramón, *C. Schunke* A170 (GH, US). Chanchamayo Valley, *C. Schunke* 22 (F), 683 (F), 913 F. La Merced, *Soukup* 1089 (F).

10. *Polypodium adnatum* Klotzsch, Linnaea 20: 395. 1847. TYPE: “Mérida Colombiae” (Venezuela), *Moritz* 353 (holotype, B; isotype, BM).

Stem rather stout, long-creeping, the leaves distant, scales appressed or at least the tips spreading. **Scales** at the stem apex narrow, light to dark brown, concolorous, clathrate, the apex acuminate to filiform, not or slightly iridescent. **Lamina** to 45 cm long (or more), 1-pinnate, monomorphic, not reduced at the base, or hardly so. **Pinnae** and **pinna-segments** sessile to adnate distally, sessile to slightly

ly adnate proximally, margin smooth, scales none or very few abaxially, sparsely to rather densely short- to long-pubescent abaxially, especially along the costa. **Veins** not readily visible, anastomosing. **Sorus** at the end of a vein, sori in 5–7 rows between costa and margin.

Terrestrial or epiphytic, in forests, 250–930 m, Huánuco, Ucayali, Cuzco, and Madre de Dios.

Tropical South America; distribution uncertain.

This species is a member of a complex that needs careful monographic study. *Polypodium richardii* Klotzsch and *Polypodium giganteum* Desv. are members of this complex and may merit recognition.

Huánuco (as San Martín): east of Tingo María, *Allard* 22233 (GH, US), 22330 (GH, US), *Croat* 21158 (MO). Tingo María, *Tryon & Tryon* 5222 (F, GH, US). **Ucayali** (as Loreto): Vicinity of Aguaytía, *Croat* 20937 (MO). **Cuzco:** Prov. Paucartambo, *Skog & Skog* 5208 (US). Prov. Quispicanchis, entre 15 mil y San Lorenzo, *Vargas* 11758 (GH). Prov. La Convención, Cordilla Vilcabamba, *Dudley* 10140 (GH). **Madre de Dios:** Prov. Tambopata, DistTambopata, *Young* 160 (F, MO, USM).

11. *Polypodium caceresii* Sodiro, Crypt., vasc. Quit. 360. 1893. TYPE: “Bosques de Oriente en la orilla del Río Napo, Cáceres” (holotype, ?; isotype, s; photo, GH of s).

Stem rather stout, long-creeping, leaves distant, scales appressed. **Scales** of the stem apex brownish, concolorous, clathrate, moderately broad, or brown to dark brown, narrow, attenuate to filiform at the apex, iridescent. **Lamina** to ca. 75 cm long, 1-pinnate, monomorphic, not reduced at the base or hardly so. **Pinnae** or **pinna-segments** sessile to slightly adnate distally, the proximal pinnae sessile, margins smooth, glabrous abaxially or rarely very sparsely short-pubescent not scaly abaxially. **Veins** not readily visible, anastomosing. **Sorus** at tip of a vein; sori in 3–7 rows between costa and margin.

Terrestrial or usually epiphytic, rarely climbing on a tree trunk, border of woods, riverbanks, cloud forests, primary forests, 100–1100 m, San Martín to Puno.

Colombia to Bolivia; Venezuela east to French Guiana; adjacent Brazil.

Polypodium articulatum Desv. (Mém. Soc. Linn. Paris 6: 236. 1827, not Poirét, 1804) is sometimes considered to be a synonym of this species. However, if the published locality “Brasilia” is correct,

it is more likely a synonym of *Polypodium fraxinifolium* Jacq., as Sehnem (Fl. Illust. Catar. Polypod. 87. 1970) has it. A photograph of the sheet in the Desvaux Herbarium P (GH, US) was considered to be *P. caceresii* by Weatherby (Contr. Gray Herb. 114: 29. 1936; and 124: 17. 1939). This is evidently correct.

San Martín: Prov. Lamas, Lamas, *Belshaw* 3430 (GH, MO, US). Tarapoto–Yurimaguas, *Knapp & Alcorn* 7793 (MO). **Loreto:** Salinas, Río Mazán, *J. M. Schunke* 376 (F, GH, US). Mishuyacu, near Iquitos, *Klug* 2572 (F, US). **Huánuco:** Prov. Huánuco, Río Ysabel, *Mexia* 8161a (F, GH, MO, US). Prov. Huánuco, 5 km of Carpish, *Tryon & Tryon* 5304 (GH). Santa Rosa, Pichis Trail, *Killip & Smith* 26177 (US). **Pasco:** Oxapampa, *Soukup* 2363 (GH). **Junín:** La Merced, *Soukup* 1093 (F). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley* 10180 (GH). Prov. Paucartambo, Kosñipata–Pilcopata, *Vargas* 11322 (GH). **Madre de Dios:** Prov. Manú, Cerro de Pantiacolla, *Foster et al.* 10820 (F). **Puno:** Prov. Carabaya, Inambari, *Vargas* 16139 (GH).

12. *Polypodium laevigatum* Cav., Descr. Pl. 244. 1802. TYPE: San Antonio, Ecuador, *Née* (holotype, MA seen by C. Chr., Dansk Bot. Ark. 9(3): 11. 1937; isotype, s, *Herb. Swartz*). Originally as *levigatum*, altered to *laevigatum* by Swartz, Syn. fil. 28. 1806.

Polypodium glaucophyllum Klotzsch, Linnaea 20: 393. August 1847. LECTOTYPE: (here designated): Mérida, Venezuela, *Moritz* 305 (lectotype, B; isotypes, BM, BR, K). The same name was published by Kunze, Farnkräuter 1: 227, t. 93, in September 1847.

Stem very slender, long-creeping, leaves mostly distant, naked or a few appressed, roundish scales present. **Scales** of stem apex roundish to acute, clathrate in the dark brown center, nearly concolorous, not iridescent. **Lamina** to ca. 25 cm long, simple, entire, gradually reduced at the apex and the base, or the base abruptly reduced, or rounded, monomorphic, margins not notched, glabrous abaxially or rarely sparingly pubescent or with a few scales. **Veins** visible, anastomosing. **Sorus** at the tip of a vein; sori in 2–9 rows between costa and margin.

Terrestrial, rupestral or usually epiphytic, in open woods, cloud or fog forests or dense, wet, montane rain forests, 100–2740 m, Piura south to Cuzco.

Costa Rica; Guadeloupe; Guianas to Colombia south to Bolivia.

Campyloneurum repens, which may be similar to this species, has two rows of sori between the

primary lateral veins while this species has a single row.

The altered spelling, *laevigatum*, has been accepted since its adoption in 1806.

Piura: Prov. Huancabamba, Canchaque–Minas Turmalina, *Sagástegui et al.* 8275 (GH, MO, US). **Cajamarca:** Prov. Hualgoyoc, Palmito and vicinity, *Hutchison & Bismark* 6399 (F, GH, MO, US, USM); Prov. San Miguel, Taulis Recorco, *Mostacero et al.* 1174 (F, GH, HUT, MO). **Amazonas:** Serranía de Bagua, *Gentry et al.* 22906 (F, MO). **San Martín:** Prov. Mariscal Cáceres, Cerro Azul, *Tryon & Tryon* 5264 (GH, US). **Huánuco:** Chinchao, entre Huánuco y Tingo María, *Ferreira* 16944 (GH, USM). Yanano, *Macbride* 3817 (F, GH, US). **Pasco:** Prov. Oxapampa, km 53 Oxapampa–Paucartambo, *Smith & Pretel* 1486 (F, MO). Yapas (as Junín), *Killip & Smith* 25541 (F, US). **Junín:** Above San Ramón, *Killip & Smith* 24592 (F). Chanchamayo Valley, *C. Shunke* 133 (US). **Ucayali:** Prov. Coronel Portillo, La Divisoria, *Dillon* 2629A (MO). **Ayacucho:** Ayna, between Huanta and Río Apurímac, *Killip & Smith* 23140 (F, GH, US). **Cuzco:** Prov. La Convención, Cordillera Vilcabamba, *Dudley* 10449 (GH, MO).

13. *Polypodium aureum* L., Sp. pl. 1087. 1753. TYPE: LINN 1251. 10. **Figure 7b.**

Polypodium leucatomos Poirlet, in Lam., Encycl. 5: 516. 1804. TYPE: Cayenne, (French Guiana) *Le Blond* (holotype, *Herb. Lam.*)

Phlebodium aureum (L.) John Sm., J. Bot. (Hooker) 4: 59. 1841.

Stem stout, rather short-creeping, leaves mostly approximate, densely covered with spreading scales. **Scales** of the stem apex reddish brown to light brown, concolorous, not clathrate, apex filiform, not iridescent, apex filiform. **Lamina** to 50 cm long (or more), deeply pinnatifid, monomorphic, not or hardly reduced at the base. **Pinnasegments** adnate, margins very slightly notched or not, glabrous abaxially, or hardly scaly. **Veins** visible, anastomosing. **Sorus** at the junction of 2 or 3 (rarely 4 or 1) veins, sori in 1 or 2 rows between costa and margin.

Terrestrial, especially among rocks, or epiphytic, 900–2600 m, Amazonas south to Puno.

Tropical America.

Phlebodium is often recognized as a genus, but if this is done then it is not obvious where to stop the segregation of *Polypodium* s.l. *Polypodium leucatomos* is a synonym of *P. aureum*, not an earlier name for *P. decumanum* as previously thought (Morton, Contr. U.S. Natl. Herb. 38: 63. 1967).

Polypodium pseudoaureum Cav. is diploid compared to *P. aureum*, which is tetraploid, and the former is sometimes treated as a separate species.

Cajamarca: Prov. Cutervo, Súcota, *Mostecero et al.* 1751 (HUT). Prov. Cajamarca, Matara–San Marcos, *López & Sagástegui* 5530 (GH). **Amazonas:** Caño Santa Lucía just east of Chachapoyas, *Wurdack* 717 (GH, US). **La Libertad:** Prov. Otuzco, Huaranchal, *Sagástegui* 0204 (GH). **San Martín:** Zepelacio, *Klus* 3537 (GH, US). **Huánuco:** Prov. Huánuco, road to Gasa, *Stork & Horton* 9875 (GH, US). **Junín:** Huacapistana, *Aguilar* 514 (GH). **Ayacucho:** Between Huanta and Río Apurímac, *Killip & Smith* 22433 (US). **Cuzco:** Quillabamba–Potrero, *Coronado* 126 (GH, US). **Puno:** Prov. Carabaya, San Gabán (Gabán), *Vargas* 18981 (GH).

14. *Polypodium decumanum* Willd., Sp. pl. ed. 4, 5: 170. 1810. TYPE: “Brasilia,” *Sieber*, comm. Hoffmansegg (B, *Herb. Willd.*). **Figure 7a.**

Phlebodium decumanum (Willd.) John Sm., J. Bot (Hooker) 4: 59. 1841.

Stem short-creeping, rather stout, the leaves more or less approximate, with mostly spreading scales. **Scales** of the stem apex light brown to reddish brown, the tip filiform, not clathrate, not iridescent. **Lamina** to ca. 1 m long (or more), pinnatisect, more or less monomorphic. **Pinna-segments** adnate, the margins notched, glabrous (not scaly nor pubescent), not glaucous, abaxially, fully adnate but broadest toward the middle. **Veins** visible, anastomosing. **Sorus** at the junction of 2 or 3 veins, or sori in 4–6 rows between the costa and margin.

Epiphytic, rarely terrestrial, on steep banks, in forests, 100–1300 m; Amazonas to Madre de Dios. Central America; West Indies; tropical South America.

This is the largest of our species of *Polypodium*. It was erroneously called *P. leucatomos* for many years, but that name is now a synonym for *Polypodium aureum*.

Amazonas: Bagua, *Ellenberg* 3571 (GH). **San Martín:** Chazuta, *Klug* 3983 (GH). Rioja, northwest of San Martín, *Soukup* 5217 (GH). **Loreto:** Prov. Maynas, Huayabamba, cerca de Iquitos, *Ferreya* 3391 (USM). Prov.

Maynas, 3 km S of Iquitos, *Tryon & Tryon* 5210 (GH). **Huánuco:** Bosque Nacional de Iparia, *J. Schunke* V. 1799 (GH, US). **Ucayali:** Pucallpa, *Woytkowski* 5751 (GH). **Junín:** Above San Ramón, *C. Schunke* A165 (US). **Cuzco:** Prov. Quispicanchis, Inamburi, *Vargas* 15441 (GH). Prov. La Convención, below San Martín, *Davis et al.* 1326 (GH). **Madre de Dios:** Maldonado, *López & Soukup* 4663 (GH).

15. *Polypodium pycnocarpum* C. Chr., Index fil. 326. 1905. 557. 1906, nom. nov. for *Polypodium macrocarpum* Presl, not Willd.

Polypodium macrocarpum Presl, Reliq. haenk. 1: 23, t. 1, f. 4. 1825, not Willd., Sp. pl. ed. 4, 5: 147. 1810. TYPE: “Hab. in Montanis Peruviae,” *Haenke* (holotype, PR).

Stem short- to long-creeping, leaves distant or approximate, scales appressed or spreading. **Scales** of the stem apex clathrate, dark brown to nearly blackish, with light brown borders, the apex obtuse to filiform, not iridescent. **Lamina** pinnatifid to pinnatisect, to ca. 15 cm long, scaly abaxially, monomorphic to dimorphic, not reduced at the base. **Pinna-segments** adnate distally, and adnate to slightly adnate proximally, sometimes pinnatifid or partly lobed, the margins notched, scaly abaxially, not pubescent usually fully adnate at the base and broadest there. **Veins** not readily visible, free. **Sorus** at the tip of a vein; sori in 1 row between costa and margin.

The correct name and classification for this species depends on a careful review of the considerable material now present in the larger herbaria. For example, among the species Maxon recognized—*P. bryopodium* Maxon, *P. mollendense* Maxon, *P. rusbyi* Maxon, *P. subvestitum* Maxon, *P. tweedianum* Hook, and *P. xantholepis* Harr.—all may be synonyms of *P. pycnocarpum*. Among other names that require assessment are *Pleopeltis pinnatifida* Hook. & Grev. (now valid), *Polypodium ratibori* Copel., and *P. ruiz-lealii* Sota.

Key to Varieties of *Polypodium pycnocarpum*

- a. Pinna-segments entire, obtuse, leaves monomorphic, lamina usually 5–8 cm long 15a. var. *pycnocarpum*
a. Pinna-segments, especially the proximal or basal ones, partly lobed or pinnatifid, acute to acuminate; leaves dimorphic, the fertile taller than the sterile; lamina usually 10–15 cm long 15b. var. *buchtienii*

15a. *Polypodium pycnocarpum* var. *pycnocarpum*.

Epiphytic, terrestrial or usually rupestral, in rock crevices, on rocky slopes, partly underneath rocks, 400–4100 m, on lomas at 400–800 m, Cajamarca to Puno.

Peru; Bolivia; Argentina; Chile; range uncertain.

Cajamarca: Prov. Celendín, cerca a Celendín, *Ferreya 15034* (USM). Prov. Contumazá, Cruz Grande Contumazá, *Sagástegui et al. 6477* (F). **La Libertad:** Prov. Otuzco, Cerro Ragache, *Sagástegui et al. 11611* (F, MO). **San Martín:** Prov. Mariscal Cáceres, Chochos, *Young & León 4583* (USM). **Ancash:** Prov. Carhuás, Cordillera Blanca, Chancos, *Hutchison & Wright 4370* (F, GH, MO, US). **Huánuco:** Mito, *Bryan 186* (F). **Lima:** Lomas de Luchay, *Tryon & Tryon 5415* (F, GH, US). Lomas de Iquanil (Granado), *Dillon et al. 4728* (HUT, USM). **Pasco:** Prov. Pasco, Entre Salcachupán y Cerro de Pasco, *Ferreya 6593* (GH). **Junín:** Tarma to San Ramón, *Croat 57703* (F). **Ica:** Los Cerrillos, 52 km south of Nasca, *Rauh* (USM). **Ayacucho:** 67 km from Nasca on road to Puquio, *Correll & Smith P150* (GH). **Apurímac:** Prov. Aymaraes, toward Caraybamba, *Saunders 771* (GH). **Cuzco:** Saxihuaman, Cuzco, *Tryon & Tryon 5346* (F, GH, US). Prov. Urubamba, Machu Picchu, *Peyton & Peyton 1057* (GH, MO). **Arequipa:** Lomas de Atiquipa, *Coronado 29* (GH, US). **Puno:** Puno, above Lake Titicaca, *Mexia 7786* (F, GH, MO, US).

15b. *Polypodium pycnocarpum* var. *buchtienii* (Rosenst.) Tryon and Stolze, *comb. nov.*

Polypodium buchtienii Rosenst., Repert. Spec. Nov. Regni Veg. 5: 237. 1908.

Terrestrial, rupestral, rarely epiphytic, on steep rocky slopes, on rocks, in dense woods, 2000–4400 m, Cajamarca south to Cuzco.

Venezuela, Ecuador, Peru, Bolivia; range uncertain.

Cajamarca: Prov. Cajamarca, Lacia San Juan, *Sánchez 4046* (F). Prov. Celendín, Canyon of Río Marañón above Balsas, *Hutchison & Wright 5335* (GH, US). **Amazonas:** ESE of Chachapoyas, *Wurdack 693* (US). **La Libertad:** Patáz, *Young 2889* (USM). 3 km west of Huanchaco, *Correll & Smith P934* (GH). **San Martín:** Prov. Mariscal Cáceres, Puerta del Monte, *Young & León 4916* (USM). **Ancash:** Muña, *Woytkowski 5290* (GH, MO); Prov. Huaráz, lower slopes of Huascarán Norte, *Saunders 1334* (F, GH). **Huánuco:** Mito, *Macbride & Featherstone 1420* (F). *1520* (F, US). **Lima:** Prov. Yauyos, cerca a Tupe, *Cerrate 1075* (GH). **Junín:** Huancayo, *Soukup 2757* (F, GH). **Huancavelica:** Prov. Tayacaja, Tocas, *Tovar 2017* (GH). **Ayacucho:** between La Quinua and Tambo, *Soukup 5652* (US). **Apurímac:** Bosques de Ampay, *Vargas 1067* (GH). **Cuzco:** Prov. Urubamba, Chincheros, *Davis et al. 1486* (F, USM).

16. *Polypodium remotum* Desv., Mém. Soc. Linn. Paris 6: 232. 1827. TYPE: “Habitat in America Calidiori” (holotype; P, *Herb. Desvauz*), seen by Weatherby, Contr. Gray Herb. 114: 32. 1936.

Polypodium leucosticton Klotzsch, Linnaea 20: 380. 1847. SYNTYPES: Colombia, *Hartweg 1499* (B); (Venezuela) Mérida, *Moritz 336* (B). *Polypodium fraseri* Kuhn, Linnaea 36: 137. 1869. TYPE: Ecuador, *Fraser* (B).

Stem short-creeping, leaves approximate, the scales appressed or somewhat spreading. **Scales** of the stem apex brownish, concolorous, or strongly bicolorous with a blackish center where clathrate, and broad, thin, crispate margins, the center often projecting so that the mass of scales appears as if it had blackish spines, not iridescent. **Lamina** to ca. 13 cm long, pinnatisect to 1-pinnate, very sparingly scaly abaxially or not so, usually dimorphic, with the fertile leaf taller than the sterile. **Distal pinnae** or **pinna-segments** adnate, the proximal ones sessile to adnate, margins often notched, especially toward the apex, trichomes absent. **Veins** not readily visible, free. **Sorus** at the tip of a vein; sori in 1 row between costa and margin.

A. R. Smith (Pterid. Venezuela, 185. 1985) reports that the spores are chlorophyllous (green).

Epiphytic, usually rupestral, or terrestrial, in forests, in cacao groves, in wet forests, on exposed cliffs, and in rocky soil, ca. 700–2600 m; Tumbes south to Cuzco.

Mexico; Central America; Greater Antilles; Venezuela and Colombia south to Bolivia.

Tumbes: Prov. Zarumillo, Campoverde, *J. Schunke V. 2409* (F, GH). **Lambayeque:** 31 km from Olmos on road to Jaen, *Correll & Smith P180* (GH). **Cajamarca:** Prov. Chota, Llama, *López & Sagástegui 5309* (GH, HUT). Prov. Santa Cruz, *Sagástegui & Leiva 14092* (F, GH, UC). **Amazonas:** Leimebamba, *Woytkowski 7751* (GH, MO). Middle eastern Calla Calla slopes, *Wurdack 1342* (US). **La Libertad:** Prov. Trujillo, Cerro Negro, *Sagástegui et al. 11015* (GH). **Huánuco:** Muña, *Bryan 425* (F, GH), *Macbride 3933* (US). **Pasco:** Quillasú, *Soukup 3287* (GH, US). Prov. Oxapampa, Canyon de Huancabamba, *León 609* (F), *620* (F). **Junín:** Chanchamayo Valley, *C. Schunke 33* (F). Carapata, *León 248* (GH, USM). **Ayacucho:** Ayna, between Huanta and Río Apurímac, *Killip & Smith 23174* (US). **Cuzco:** Prov. La Convención, Potrero, *Tyron & Tryon 5389* (F, GH, US).

17. *Polypodium furfuraceum* Schlect. & Cham., Linnaea 5: 607. 1830. TYPE: Near Jalapa, Mexico, *Schiede & Deppe* (holotype, B).

Stem short-creeping, leaves approximate, scales more or less appressed. **Scales** of the stem apex not clathrate, very light brown to whitish, concolorous, elongate, the apex acuminate not iridescent. **Lamina** to ca. 15 cm long, pinnatisect, densely scaly abaxially with whitish or nearly whitish scales, not or hardly reduced at the base. **Pinna-segments** adnate, margins not notched, trichomes absent, fully adnate at the base and broadest there. **Veins** not readily visible, free. **Sorus** at the end of a vein; sori in 1 row between costa and margin.

Epiphytic, 850 m, Cuzco. Rarely collected in southern Peru.

Mexico and Central America; Peru and Bolivia.

Cuzco: Santa Ana, *Cook & Gilbert 1510* (US). Prov. La Convención, Ichiquita, *Vargas 22334* (GH). Prov. La Convención, Sahuayaco, *Vargas 6273* (GH). Prov. La Convención, Echarate, *Vargas 22771* (GH). Quillabamba, *Soukup 149* (F).

18. *Polypodium polypodioides* (L.) Watt, Canad. Nat. Ser. 2, 3: 158. 1867.

Acrostichum polypodioides L. Sp. pl. 1068. 1753. LECTOTYPE (by Weatherby, Contr. Gray Herb. 124: 28. 1939): Jamaica, *Herb. Plukenet* (BM).

Polypodium incanum Sw., Prod. 131. 1788, *nom. superfl. illegit.*

Stem long-creeping, slender, the leaves mostly distant, scales appressed. **Scales** of the stem apex bicolorous, dark brown to blackish with lighter margins, clathrate in the darker center, the apex acute to acuminate not iridescent. **Lamina** to ca. 15 cm long, usually less, deeply pinnatifid to pinnatisect, densely scale abaxially, monomorphic, not or only slightly reduced at the base. **Pinna-segments** adnate distally, the proximal ones sessile to adnate, margins not notched, the scales abaxially broadly to narrowly triangular, trichomes absent. **Veins** not readily visible; some free or all anastomosing at least along the costa. **Sorus** at the end of a vein; sori in 1 row between the costa and margin.

All collections from Peru are evidently var. *burchellii* (Baker) Weath., Contr. Gray Herb. 124: 29. 1939 (*Polypodium incanum* var. *burchellii* Baker in Mart. Fl. Bras. 1(2): 526. 1870. TYPE: Goyaz, Brazil, *Burchell 6998*, holotype, k; isotype, GH!). The five varieties of *P. polypodioides* are distinguished and discussed by C. A. Weatherby in the reference cited above. Variety *burchellii* has some,

or most, veins anastomosing, the scales of the lamina, abaxially, strongly fimbriate, ovate and dilated at the base and with a pronounced subulate apex (scales gomphoid or subgomphoid).

Epiphytic or rarely rupestral, in dense woods, in cacao groves, on fallen trees in forests, in pastures, on rock walls, 250–1300 m, Cajamarca to Madre de Dios.

Guianas, Venezuela, and Colombia to Bolivia; Brazil.

Cajamarca: San Ignacio, *Díaz 2056* (F, MO). **Amazonas:** Prov. Bagua, entre Aramango y Montenegro, *López et al 4259* (GH). **San Martín:** Prov. Lamas, Lamas to San Antonio, *Belshaw 3455* (F, GH, MO, US). 5 km abajo de Tocache Nuevo, *J. Schunke V. 3883* (F, MO, US, USM). **Loreto:** Prov. Maynas, Lupuna Cocha, across the Amazon from Iquitos, *Tryon & Tryon 5190* (F, GH, US). Prov. Maynas, island in front of Iquitos, *Simpson, & Schunke 691* (F, GH, US). **Junín:** Yaupe, *Woytkowski 6411* (GH, MO, US). **Ayacucho:** Estrella, between Huanta and Río Apurímac, *Killip & Smith 23060* (F, GH, US). **Cuzco:** 2 km east from Colpe de Guacomayo, *Núñez 6518* (MO). **Madre de Dios:** Cocha Cashu, Parque Nacional de Manú, *Foster et al. 3451* (F).

19. *Polypodium megalolepis* Maxon & Morton, Bull. Torrey Bot. Club 66: 39. 1939. TYPE: Dept. Cuzco, Lucumayo Valley, Peru, *Cook & Gilbert 1283* (holotype, US!).

Stem long-creeping, leaves mostly distant, scales more or less appressed. **Scales** of the stem apex brown to mostly light brown, concolorous, or slightly bicolorous, not clathrate, apex acuminate to filiform not iridescent. **Lamina** pinnatifid to pinnatisect, to ca. 12 cm long, monomorphic, broadest at the base. **Pinna-segments** fully adnate or slightly joined to others, broadest at the base, not pubescent, definitely to moderately scaly abaxially, the scales roundish to ovate-lanceolate. **Veins** not readily visible anastomosing. **Sorus** at the tip of a vein; sori in 1 row between the costa and margin.

Rupestral, among scattered shrubs, 3900–4100 m, Cuzco.

Peru; Bolivia.

Only known from Peru by the type collection.

20. *Polypodium thyssanolepis* Klotzsch, Linnaea 20: 392. 1847. SYNTYPES: Colombia, *Otto 896* (B); Venezuela?, *Moritz 22* (B).

Stem short- or moderately long-creeping, the leaves mostly approximate, scales more or less

appressed. **Scales** of the stem apex light brown to reddish brown, slightly to definitely clathrate, slightly to definitely bicolorous, the apex acute to acuminate, not iridescent. **Lamina** pinnatisect or 1-pinnate-pinnatifid proximally, to 35 cm long, monomorphic to dimorphic, not reduced at the base or only slightly so. **Pinna-segments** slightly adnate to adnate, the margins not notched, moderately to densely scaly abaxially, the scales lanceolate to ovate-lanceolate, the apex acuminate to filiform, not pubescent, often fully adnate at the base and broadest there. **Veins** not readily visible, partly free or anastomosing along the costa. **Sorus** at the tip of a vein; sori in 1 row between costa and margin.

Terrestrial to usually rupestral or rarely epiphytic, at the base of rocks, on rocky banks, on stone walls, among open sunny rocks, 1600–3200 m, Cajamarca south to Cuzco.

Southwestern United States; Mexico; Central America; Greater Antilles; Venezuela to Bolivia.

Cajamarca: Prov. Celendín, Conga de Uriquís, *Sagstegui et al.* 8417 (F, MO). **Amazonas:** Leimebamba, *Woytkowski* 7790 (GH, MO), 7843 (GH, MO). **La Libertad:** Prov. Otuzco, Chaullacocha, *Saunders* 899 (F, GH). Prov. Otuzco, Cerro Chologday, *Sagstegui* 0076 (GH, HUT). **Huánuco:** Pachachupan, cerca de Acomayo, *Ridoutt* (GH, USM). Mito, *Macbride & Featherstone* 1576 (F, GH, US), 1774 (F, GH, US). **Junín:** Canyon of Río Huasahuasi, *Hutchison* 1060 (F, GH). **Apurímac:** Prov. Andahuallas, Quebrada de Toxoma, *Velarde* 4947 (GH). **Cuzco:** Prov. Urubamba, Hacienda Huarochari, *Vargas* 14968 (GH).

21. ***Polypodium bombycinum*** Maxon, Contr. U.S. Natl. Herb. 17: 592. 1916. TYPE: Boqueron del Río Dagua, Prov. Cali, Colombia, *Lehmann* 7666 (holotype, US!; isotype, GH!; photo, GH of US).

Stem short-creeping, leaves approximate, scales appressed. **Scales** of the stem apex light brown to brown, slightly bicolorous, the darker center hardly or not clathrate, apex acuminate to filiform, not iridescent. **Lamina** pinnatisect, to 60 cm long, monomorphic, gradually reduced at the base of auriculiform lobes. **Pinna-segments** adnate, the margins not notched, abundantly scaly abaxially, the scales reddish brown, not pubescent, fully adnate at base and broadest there. **Veins** not readily visible, anastomosing. **Sorus** at the end of a vein; sori in 1 row between costa and margin.

Epiphytic or rarely terrestrial, swamp forests, on

palms or on tree ferns, 100–580 m, Loreto, Cuzco, and Madre de Dios.

Panama; northern South America; Amazonian Brazil; Peru; Bolivia.

Polypodium balaoense Hieron. has the scales on the lamina abaxially ovate-triangular with a long tip in contrast to the gomphoid scales of *P. bombycinum*, which are mostly orbicular, with a filiform tip.

Loreto: Prov. Maynas, Río Santa María, *King* 458 (F). **Cuzco:** 2 km east from Colpa de Guacamayos, *Núñez* 6522 (MO). Puente de Inambari, *Vargas* 18464 (GH). **Madre de Dios:** Prov. Tambopata, Tambopata Reserve, *Young* 39 (MO), *Funk et al.* 8198 (US). 39 km southwest of Puerto Maldonado, *Smith et al.* 1130 (F).

22. ***Polypodium balaoense*** Hieron. Bot. Jahrb. Syst. 34: 529. 1905. TYPE: “prope Balao (Ecuador),” *Eggers* 14286 (holotype, B).

Stem short-creeping, leaves approximate, scales appressed. **Scales** of the stem apex brown, bicolorous, the darker center clathrate, apex acuminate to filiform, not iridescent. **Lamina** pinnatisect to ca. 60 cm long, monomorphic, gradually reduced at the base to auriculiform lobes. **Pinna-segments** adnate, the margins not notched, somewhat scaly abaxially, the scales whitish, not pubescent, fully adnate at base and broadest there. **Veins** not readily visible, anastomosing. **Sorus** at the end of a vein; sori in 1 row between costa and margin.

This species seems to intergrade with *P. bombycinum*.

A single collection from northern Peru.

Panama south to Peru; Galápagos Islands.

Tumbes: (Prov. Tumbes), hwy. to El Caucho, *Coronado* 234 (UC).

23. ***Polypodium monosorum*** Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Ges. Naturk 5: 319. 1811. TYPE: “Peruvia” (holotype, P), *Herb. Desvaux*, a single pinna). A label on the sheet refers to Herb. Jussieu, where sheet 1124, *Jos. Jussieu*, “Perou,” P, photo, GH is undoubtedly the source of Desvaux’s pinna. The specimen could have been collected in what is now Ecuador.

Stem long-creeping, leaves mostly distant, scales appressed, or sometimes the stem partially naked. **Scales** of the stem apex linear, usually minutely denticulate, bicolorous with very narrow, lighter

margins and a clathrate, brown or darker center, not iridescent or slightly so, the apex attenuate. **Lamina** to 20 cm long, 2-pinnate-pinnatifid to 3-pinnate, slightly dimorphic, slightly reduced at the base, or not. **Pinnae** stalked, mostly triangular, not pubescent abaxially, where the scales are deltoid-acuminate. **Veins** not readily visible, free. **Sorus** at the end of a vein; sori individual on the ultimate segments.

A single collection from Huánuco at 2745 m, in addition to the type.

Colombia to Peru.

The somewhat similar *Polypodium murorum* Hooker is common in Ecuador and may also grow in Peru. It has the lamina to 1-pinnate-pinnatifid, most or many of the adaxial scales are rounded, and the scales or the stem apex are definitely and strongly denticulate.

Huánuco: Mito, *Bryan 208* (F).

Comments

Following are two names based on Peru material or credited to Peru.

Polypodium crystalloneuron Rosenst., Repert. Spec. Nov. Regni Veg. 11: 57. 1912. SYN-TYPES: Unduavi, Bolivia, *Buchtien "2773-75"* (holotype, not located). Hensen (1990) has selected *Buchtien s.n.*, B, as lectotype; isosyntype, *Buchtien 2775* (UC!, US!).

Material assigned to this species occurs in Bolivia and southern and central Peru. However, it is quite possible that it is a southern variation of *Polypodium loriceum* and should be treated as a synonym or as an infraspecific taxon under that species. Because of doubt about its taxonomic status, it is dealt with here rather than in the text proper.

The taxon has a stem that is usually thicker than that of *P. loriceum*, and the stem scales are more persistent. The stem also more often has a chalky white deposit (dry), which is rare in *P. loriceum*. Hensen (1990) said that *P. loriceum* has the vascular bundles of the stem (meristeles) with a dark sclerenchymatous sheath, while this is lacking in *P. crystalloneuron*.

The taxon grows in Peru and Bolivia.

The Peru material seen is as follows.

Ancash: Prov. Yungay, Huascarán National Park, *D. Smith et al. 9091* (MO), *D. Smith & K. Goodwin 8828* (MO). **Cuzco:** Prov. Paucartambo, *Núñez et al. 8491* (MO, UC). Prov. Paucartambo, *Tupayachi 55* (UC), *56* (MO). Prov. Calca, *Núñez 6724* (MO). Prov. Urubamba, *Peyton & Peyton 1091* (MO).

Polypodium mutabile Kunze, *Linnaea* 9: 46. 1834.

TYPE: Peru, *Poeppig* (holotype, LZ, destroyed; isotype, ?, w).

On the basis of an authentic specimen at w, Hensen (1990) placed this name as a synonym of *Polypodium fraxinifolium*.

The following three hybrids have been proposed for Peru *Polypodium*. Others will probably be detected as the species are studied closely.

***Polypodium lasiopus* × *mollendense*.**

Polypodium Xhuancayanum Kunkel, *Biota* 6: 157, figs. C–D. 1966. TYPE: Huancayo, Peru, *Kunkel 6569* (holotype, *Herb. Kunkel* ?). In the present treatment, *P. mollendense* is a synonym of *P. pycnocarpum* var. *pycnocarpum*.

***Polypodium thyssanolepis* × *Pleopeltis macrocarpa*.**

Polypodium leucosporum Klotzsch, *Linnaea* 20: 404. 1847. TYPE: Mucuchies, Mérida (Venezuela), *Moritz 306* (holotype, B).

This is a putative hybrid of *Pleopeltis macrocarpa* and *Polypodium thyssanolepis*. Other species of *Pleopeltis* may be involved as parents of other hybrids in Mexico and Central America (see Mickell & Beitel, *Amer. Fern J.* 77: 16–27. 1987). The hybrid plants are variously intermediate between a species with an entire lamina and one with a deeply pinnatifid or pinnatisect lamina. The spores are abortive and the lamina is definitely scaly abaxially.

Plants of this hybrid occur sporadically from Piura and Amazonas to Cuzco, at 1800–2800 m.

Piura: Prov. Huancabamba, 10 km N of Huancabamba, *Hutchison & Wright 6601* (F, GH, US). **Amazonas:** Prov. Chachapoyas, Calla Calla Slopes, *Wurdack 1181* (F, GH, US). Prov. Chachapoyas, Pomachocha, *López et al. 4395* (GH), *4396* (GH). **Huánuco:** La Molina, near Panao, *Asplund 13662* (US). **Junín:** Between Tarma and San Ramón, *Croat 57700* (F). **Apurímac:** Andahuailas, *Herrera 1496* (GH). **Cuzco:** Prov. Anta, *Vargas 17639* (GH).

***Polypodium laevigatum* × *lasiopus*.**

Goniophlebium semipinnatifidum Fée (Mém. foug. 5)
Gen. fil. 256. 1852. TYPE: Pamplona, Columbia,
Funck & Schlim 1363 (holotype, P?).
Polypodium semipinnatifidum (Fée) Mett., Abh.
Senckenberg Naturf. Ges. 2: 80. 1856.

A single collection of this hybrid is from Peru, Amazonas, 1–5 km west of Molinopampa, *Wurdack 1363* (MO, US). Other specimens of this collection at F and GH are *Polypodium laevigatum*. The parents of this hybrid are uncertain. In Peru they are probably *P. laevigatum* × *lasiopus* and elsewhere another parent with *P. laevigatum* is likely involved. The lamina has few or no scales on the abaxial side. At the present time the epithet *semipinnatifidum* is used to include all similar hybrids.

Terrestrial in the jalca zone, 2400–2500 m, Amazonas.

Columbia; Ecuador; Peru.

Polypodium dulce Poir. in Lam., Encycl. 5: 523. 1804. TYPE: Morne de la Calebasse, Martinique.

Plumier (Traité foug. Amér., t. 80. 1705) has been cited as the lectotype by Proctor and Lourteig (*Bradea* V (40): 387. 1990). However, the specimen may take precedence over the figure as a type and this (Jussieu Herb. Cat. 1085) has been identified in microfiche as *Polypodium loriceum* by Lellinger (pers. comm.). Because there are obvious problems in the typification of the name and the identification of the type, the name has neither been accepted nor placed in synonymy.

IV. *Pleopeltis*

Pleopeltis Willd., Sp. pl. 5: 211. 1810. TYPE: *Pleopeltis angusta* Willd. **Figure 8.**

Plants epiphytic or epipetric, rarely terrestrial. **Stem** long- or short-creeping, bearing peltate or peltately attached, clathrate or nonclathrate, usually comose, scales. **Leaves** ca. 5–40 cm long, monomorphic or slightly dimorphic, articulate to

the stem or to short phyllopodia, approximate to widely spaced. **Lamina** entire (or pinnatisect in *P. angusta*, not in Peru), moderately to abundantly scaly, especially abaxially, the scales peltately attached, most of them circular (or with stellate arms from the circular base in *P. fuscopunctata*). **Veins** anastomosing, with or without included free veinlets. **Sori** round to somewhat elongate, usually borne at the junction of 2 or more veins, on a somewhat raised receptacle, exindusiate, intermixed with peltate or filiform paraphyses. **Spores** monolete, ellipsoid, with long laesura.

Circumscription of this genus is still actively debated, especially in relationship to *Microgramma*. To some taxonomists it consists of a dozen Neotropical species, plus one other found in Africa, India, and Sri Lanka. Others include the Asian genus *Lepisorus*, with about 25 species. Even with *Pleopeltis*, s.s. some authors prefer to exclude *P. fuscopunctata* and *P. percuta*, transferring these two to *Microgramma* (Sota, 1986). For purposes of this flora, *P. percuta* is included in *Pleopeltis* on the basis of its circular lamina scales, sublathrate stem scales, and the peltate paraphyses that cover the immature sorus (although the latter are rarely seen on dried specimens).

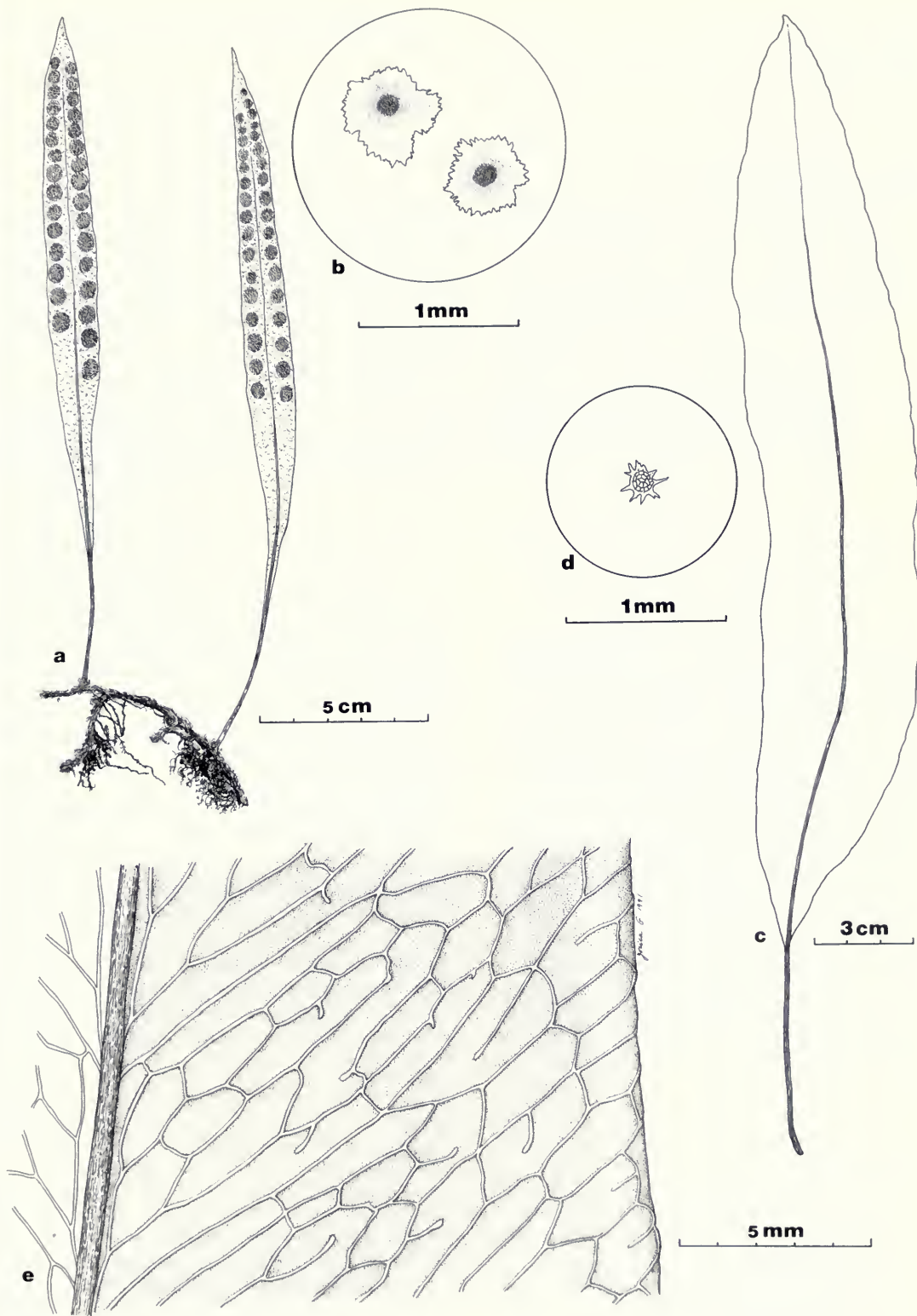
Stem scales are not or scarcely clathrate in *Pleopeltis fuscopunctata* or *P. percuta*, but they do have deciduous soral paraphyses. Lamina scales, though very small and appearing at first to be merely glandular dots, actually consists of stellate arms spreading from a minute, circular base. Except for *P. fuscopunctatum*, leaves of *Pleopeltis* are mostly coriaceous, whereas leaves of *Microgramma* are commonly chartaceous or thinner in texture.

There has been hybridization between some species of *Pleopeltis* and *Polypodium*, in one case involving *Pleopeltis macrocarpa*. See treatment of *Polypodium thyssanolepis* × *Pleopeltis macrocarpa* in **Comments** following the genus *Polypodium*.

References

SOTA, E. R. DE LA. 1986. Sobre la posición sistématica de *Polypodium fuscopunctatum* Hook.

FIG. 8. *Pleopeltis macrocarpa* var. *macrocarpa*: a, habit; b, lamina scales. *Pleopeltis macrocarpa* var. *laciniata*: c, sterile leaf; d, lamina scale. *Pleopeltis percuta*: e, section of sterile lamina. (a, b from *Hutchison & Wright 5370*, F; c, d from *Wurdack 2034*, USM; e from *Dudley 11418*, GH.)



Key to Species of *Pleopeltis*

- a. Lamina firm-herbaceous; veins distinct on both surfaces; lamina dark-punctate with minute, stellate scales usually less than 0.1 mm in diameter (these, without high magnification, appearing as glandular dots) 4. *P. fuscopunctata*
- a. Lamina chartaceous to subcoriaceous; veins obscure or indistinct, at least abaxially; lamina with circular scales mostly 0.2–0.5 mm in diameter b
- b. Sporangia intermixed with dense masses of persistent, filiform paraphyses 3. *P. percussa*
- b. Sporangia intermixed with few to many, commonly fugacious, peltate paraphyses c
- c. Stem scales lanceolate to ovate, bicolorous, each not obscured by a mass of trichomes; sori circular to ovoid, 1–1.5 times as long as broad 1. *P. macrocarpa*
- c. Stem scales mostly circular, blackish, each usually completely obscured by a dense mass of trichomes; sori elongate, commonly 2–4 times as long as broad 2. *P. astrolepis*

1. *Pleopeltis macrocarpa* (Willd.) Kaulf., Berlin Jahrb. Pharm. 21: 41. 1820.

Plants epiphytic or epipetric, rarely terrestrial. **Stem** long-creeping, densely covered with lanceolate to ovate scales, these 1–2 mm long, bicolorous (tawny to orange with blackish centers), and with erose-ciliolate margins. **Leaves** 6–40 cm long, 0.8–4 cm broad, petiolate, articulate to the stem, essentially monomorphic. **Petiole** 0.5–7 cm long, terete (in Peru). **Lamina** simple, margins entire or rarely slightly sinuate, chartaceous to subcoriaceous, narrow to oblong-elliptic, with acute to attenuate apex, and cuneate or attenuate base, abundantly scaly, the scales peltate, scattered, of 2 kinds, most of them oblong, 0.2–0.5 mm in diameter, concolorous or bicolorous, these often intermixed with larger, ovate-acuminate ones. **Costa** yellowish (or rarely blackish at base) abaxially. **Veins** distinct to obscure. **Sori** somewhat immersed, ovoid, discrete (or rarely a few of them

merging), the sporangia intermixed with few to many circular, peltate, commonly fugacious, paraphyses.

The species occurs in the Greater Antilles, from Mexico to Chile and Argentina, and in Africa to India and Sri Lanka.

There are five varieties of *P. macrocarpa*, three of them confined to Mexico and/or Central America. One of these, var. *trichophora* (Weath.) Pic.-Ser., is distinguished by the conspicuous trichomes borne at the bases of stem scales. Another, var. *complanata* (Weath.) Lell., has a conspicuously flattened petiole. A third, var. *crassinervata* (Fée) Moore, is distinguished by the stem scales, which are pale and concolorous (except for the dark point of attachment). The other two varieties occur in Peru.

Key to Varieties

- a. Lamina scales distinctly bicolorous, circular ones 0.3–0.5 mm in diameter, the margins erose or erose-ciliolate; lamina attenuate at base, coriaceous or subcoriaceous and the veins obscure 1a. var. *macrocarpa*
- a. Lamina scales concolorous, circular ones 0.2–0.3 mm in diameter, the margins deeply lacinate; lamina broadly or narrowly cuneate at base, chartaceous and the veins distinct adaxially 1b. var. *laciniata*

1a. *Pleopeltis macrocarpa* var. *macrocarpa*. Figures 8a–b.

Polypodium lanceolatum L., Sp. pl. 2: 1082. 1753, not *Pleopeltis lanceolata* Kaulf. 1824. TYPE: Petiver, Pteri-graphia Americana, t. 6, f. 2. 1712.

Polypodium macrocarpum Willd., Sp., pl. ed. 4, 5: 147. 1810. TYPE: Mauritius, Bory (holotype, b, Herb. Willd. 19629; isotype, r).

Leaves 6–35 cm long, 0.8–2.4(–3) cm broad. Petiole 0.5–7 cm long. Lamina narrow-elliptic, attenuate at base, coriaceous or subcoriaceous, scales castaneous, with margin whitish to tawny, erose or erose-ciliate.

In wet forests and wooded ravines, or in lomas, on tree trunks and branches, on cliffs or among rocks, occasionally in rocky soil, 500–2900 m, Piura to Amazonas, south to Arequipa and Puno.

General distribution is the same as the species.

Piura: Prov. Huancabamba, Dist. Sapalacha, *Sagástegui & Cabanillas* 8596 (F, HUT). Lambayeque: Prov. Ferreñafe, Tute, *Llatas* Q. 2513 (F). Cajamarca: Prov. Celendín, Canyon of Río Marañón above Balsas, *Hutchison & Wright* 5370 (F, GH). Amazonas: Prov. Chachapoyas, Quebrada Molino below Chachapoyas, *Wurdack* 633 (F, GH, US). Huánuco: Mito, *Macbride & Featherstone* 1775 (F, GH, US). San Martín: San Martín, Boca Toma del Shilcayo, N of Tarapoto, *Alcorn & Mallet* 25 (MO). Junín: Prov. Tarma, 5 km SW of Huacapistana, *Tryon & Tryon* 5427 (GH, US). Ica: San Gallan Island, *Murphy* 3475 (US). Apurímac: Prov. Caraveli, Lomas de Pongo, *Ferreira* 13434 (GH, USM). Cuzco: Quillabamba, Potrero, *Coronado* 125 (GH, US). Arequipa: Lomas de Atiquipa, *Coronado* 36 (GH, US). Puno: Ollachea to San Gabán, *Dillon et al.* 1155 (F, USM).

1b. *Pleopeltis macrocarpa* var. *laciniata* Stolze, var. nov. Figures 8c–d.

Folia 2.5–4 cm latae. Lamina chartacea, oblongo-elliptica, ad basin cuneata, paleis concoloribus, pro parte maxima circularibus, 0.2–0.3 mm diametris, ad marginem profunde laciniatis.

TYPE—Peru, Dept. Huánuco, Tingo María, hills above river, *Moran & Fernández* 3681 (holotype, USM!; isotypes, F!, MO; photos, F, MO, UC of USM).

In forests, on rocky slopes or on trunks of trees, 400–700 m, Amazonas, Huánuco, and Pasco.

Endemic.

This is the most distinctive variety of *P. macrocarpa*. It is readily distinguished from all the others by the larger lamina with broad- to narrow-cuneate (rather than attenuate) base and by the margin and color of the laminar scales. In other va-

rieties the scales are bicolorous, i.e., with a much darker center, and the margins are subentire to, at best, erose-fimbriate. In var. *laciniata*, scales are rather uniformly castaneous, and both the circular and the elongated ones are deeply dissected with long and acute laciniae, much like those of *P. fuscopunctata*. Even the abundant peltate scales intermixed with maturing sporangia are similarly laciniate.

Although the new variety is known thus far only from the type and two other specimens, its relatively large leaves should be conspicuous enough to enable collectors to locate more specimens in the future.

Amazonas: Prov. Bagua, Río Marañón, above Cascadas de Mayasi, *Wurdack* 2034 (USM). Pasco: Prov. Oxapampa, Palcazú, Río Alto Iscozacín, Ozuz to Pescado, *Foster & d'Achille* 10121 (F).

2. *Pleopeltis astrolepis* (Liebm.) Fourn., Mexic. pl. 1: 87. 1872.

Grammitis lanceolata Schkuhr, Vier Zwangiste Kl. Linn. Pfl.-Syst. 1: 9, t. 7 in part. 1804, not *Polypodium lanceolatum* L. 1753, nor *Pleopeltis lanceolata* Kaulf. 1824. TYPE: Jamaica, probably Swartz (holotype, HAL).

Grammitis elongata Sw., Syn. fil. 22, 213. 1806, not *Pleopeltis elongata* Kaulf., 1824. *Nom. nov.* for *G. lanceolata* Schkuhr, not Swartz.

Grammitis revoluta Willd., Sp. pl. ed. 4: 139. 1810, not *Pleopeltis revoluta* Alderwerelt. 1909. TYPE: Locality and collector unknown (holotype, b, Herb. Willd. 19584).

Grammitis squamulosa Splitg., Tijdschr. Nat. Gesch. Physiol. 7: 398. 1840, not *Pleopeltis squamulosa* (Kaulf.) Presl, 1836, *nom. illeg.* TYPE: Surinam, collector unknown (holotype, l).

Polypodium astrolepis Liebm., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 5, 1: 185. 1849. LECTOTYPE (designated by A. R. Smith, Fl. Chiapas 2: 177. 1981): Mexico, Oaxaca, Trapiche de la Concepción, *Leibmann* Fl. Mex. 87, lower specimen (c).

Pleopeltis revoluta (Willd.) A. R. Smith, Proc. Calif. Acad. Sci. 40: 230. 1975, not Alderwerelt, 1909.

Plants epiphytic, occasionally epipetric. Stem usually long-creeping, amply provided with blackish peltate, circular, or elongate scales, these 0.3–0.5 mm long, bearing, and usually obscured by, abundant, castaneous, unicellular trichomes to 1 mm long. Leaves 4–15 cm long, 0.4–1.8 cm broad, subsessile or very short-petiolate, borne on short (0.5–1.5 mm) phyllopodia, monomorphic or subdimorphic (sterile one frequently shorter and/or broader than the fertile); petiole 0.4–1.5 cm long, conspicuously flattened. Lamina simple, entire,

chartaceous to coriaceous, narrow-elliptic to linear-lanceolate, attenuate at base, bearing scattered, circular, lacerate-stellate scales to 0.3 mm in diameter, and some longer, ovate-lanceolate ones near the costa and margin. **Costa** castaneous to blackish abaxially. **Veins** indistinct or obscure. **Sori** oblong or elliptic, 2–4 times as long as broad, rarely merging to form longer lines, a few, deciduous, peltate scales intermixed with sporangia, but rarely seen.

In forests, on trees or rarely on mossy rocks, 900–1500 m, Junín and Cuzco.

Mexico to Panama; West Indies; Columbia to the Guianas, south to Bolivia and Brazil.

Junín: 20 km from San Ramón, road to Tarma, *León et al.* 339 (F, USM). Chanchamayo, San Ramón near La Merced, *Teppner* 206 (us). **Cuzco:** Chaupimayo, Valle del Puerto, *Bües* 2012 (us). Quillabamba, *Soukup* 179 (F).

3. *Pleopeltis percussa* (Cav.) Hooker & Grev.,
Icon. fil., t. 67. 1828. **Figure 8e.**

Polypodium percussum Cav., Descr. pl. 243. 1802.
TYPE: Peru (as Mariannas), *Née* (holotype, MA; photo, F).

Microgramma percussa (Cav.) Sota, Physis C44: 19. 1986.

Plants epiphytic, occasionally terrestrial, rarely epipetric. **Stem** long-creeping, 0.2–2 mm thick, densely scaly, the scales of two kinds: minute, castaneous to blackish, appressed, circular ones, these often obscured by larger to (3 mm), and flaccid, subappressed or spreading ones, the latter lanceolate, subentire, nonclathrate, tawny to orange, usually with a castaneous point of attachment, peltate above the base. **Leaves** widely spaced, petiolate, articulate to the stem, essentially monomorphic. **Petiole** 0.5–3 cm long. **Lamina** simple, entire, 7–27 cm long, 1–3.5 cm broad, coriaceous, opaque, narrow-elliptic, attenuate at both ends, essentially naked adaxially, minutely peltate-scaly abaxially, the scales abundant, scattered, mostly 0.2–0.3 mm broad, circular, entire, some much larger, ovate-lanceolate ones along the costa. **Veins** immersed and usually obscure, copiously anastomosing, only a few areoles containing free veinlets, these oriented in all directions. **Sori** discrete, circular to oval, rather deeply impressed, paraphyses copious, filiform, ferruginous to castaneous, forming dense masses among the sporangia.

Very common, in or at edges of wet forests and

thickets, on stumps, tree trunks, and high branches, occasionally terrestrial or clambering over rocks, 100–2250 m, Cajamarca to Loreto, south to Ayaacucho and Madre de Dios.

Southern Mexico to Panama; Columbia to the Guianas, south to Bolivia and Brazil.

Cajamarca: Prov. Cutervo, 1 km from San Andrés, *Sánchez Vega* 4475 (F, MO). **Amazonas:** Prov. Bagua, on Cerro Tapur, 40 km S of Bagua Grande, *Hutchison* 1477 (F, GH, UC). **San Martín:** Prov. Mariscal Cáceres, Dist. Campanilla, Muyuna de Murga, *Schunke V.* 4139 (F, UC, us). **Loreto:** Dist. Iquitos, Río Napa near Mazán, *Mexia* 6473 (F, GH, UC, us). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Hacienda Exito, *Mexia* 8164 (BM, F, GH, UC, us). **Pasco:** 45 km from Pte. Río Paucartambo on road to Oxapampa, *León et al.* 483 (USM). **Junín:** Prov. Tarma, Huacapistana, between Tarma and San Ramón, *Ferreira* 11260 (GH, USM). **Ucayali:** Prov. Coronel Portillo, La Divisoria, 20 km NNE of Tingo María, *Dillon* 2629 (F, USM). **Ayacucho:** Ccarrapa, between Huanta and Río Apurímac, *Killip & Smith* 22374 (F, us). **Cuzco:** 40 km W of Pilcopata on road to Paucartambo, *Gentry et al.* 23671 (F, MO, us). **Madre de Dios:** Cocha Cashu, Manú National Forest, between Paragua and Tayakome, *Foster et al.* 3419 (F).

4. *Pleopeltis fuscopunctata* (Hooker) R. & A.
Tryon, Rhodora 84: 129. 1982.

Polypodium fuscopunctatum Hooker, Sp. fil. 5: 69. 1863. TYPE: Ecuador, Chimborazo, *Spruce* 5734 (holotype, K; photo, GH).

Microgramma fuscopunctata (Hooker) Vareschi, Flora Venezuela 1: 893. 1969.

Plants epiphytic. **Stem** long-creeping, 0.8–1.5 mm in diameter, densely (sometimes completely) covered with appressed to (at the tip) spreading scales, these 2–3 mm long, flaccid, ovate, acute, peltately attached above the base, orange or tawny, the margins subentire. **Leaves** (10–)12–25(–30) cm long, (1.3–)1.8–2.5(–3) cm broad, subsessile to short-petiolate and articulate to the stem or to very short phyllopodia, essentially monomorphic. **Petiole** 0–10 mm long. **Lamina** simple, entire, firm-herbaceous, lance-elliptic, attenuate at both ends, surfaces punctate with dark brown, minute (0.05–0.1 mm), peltate, circular-stellate scales, costa abaxially with a few, scattered, light brown, ovate scales to 2 mm long. **Veins** distinct, somewhat prominent, primary and other ones equally prominent, areolate, the costal areoles frequently containing one, short, recurrent, free veinlet. **Sori** circular, borne in a single medial to supramedial row between costa and each margin.

Climbing on tree trunks and branches, or along

lianas, in and at edges of dense forests, 100–1250 m, Tumbes, Amazonas and Loreto south to Cuzco and Puno.

Trinidad; the Guianas to Columbia, south to Brazil and Bolivia.

The relationship of this species is not clear. Some authors place it in *Microgramma*, partly because of its thinner lamina texture, distinct veins, and nonclathrate stem scales. It also apparently lacks the peltate paraphyses and circular lamina scales so typical of *Pleopeltis*. However, there are stalked, peltate paraphyses in immature sori, although these are rarely seen in dried specimens. Furthermore, the laminar surface is finely punctate with what appear to be glandular dots. High magnification (80–100×) reveals these to be peltate, circular scales ca. 0.05 mm in diameter, each with 6–8 short to long, marginal arms in a stellate pattern. In this respect, they are nearer to the typical lamina scales of *Pleopeltis* than to the noncircular ones of *Microgramma*.

This species apparently occupies an intermediate position between the two genera. For purposes of this treatment, it is maintained in *Pleopeltis*, since it keys out most effectively with the characters of lamina scales and paraphyses.

Tumbes: Prov. Zarumilla, Dist. Matapalo, Bosque Nacional de Tumbes, *Simpson & Schunke 381* (F, GH, US, USM). **Amazonas:** Prov. Bagua, forest behind Parcelación Monterrico, *Knapp & Alcorn 7624* (F, MO). **San Martín:** Prov. Mariscal Cáceres, Tocache Nuevo, *Schunke V. 6950* (F, UC). **Loreto:** Left bank of Río Santiago above Pongo de Manseriche, *Mexia 6144a* (GH, UC, US). **Huánuco:** Near Divisoria, 80 km E of Tingo María, *Gentry et al. 16053* (F, MO, UC). **Pasco:** Prov. Oxapampa, Gran Pajonal, near Chequitavo, *D. Smith 5187* (MO, UC, USM). **Cuzco:** Prov. La Convención, Río Klaus near confluence with Río Mapitunuari, *Dudley 10130* (GH). **Madre de Dios:** Confluence of Ríos Tambopata and La Torre, SW of Puerto Maldonado, *S. F. Smith et al. 544* (F, US). **Puno:** Prov. Carabaya, near San Gabán, *Vargas 17559, 18914* (GH).

V. *Dicranoglossum*

Dicranoglossum John Sm., Bot. voy. Herald (Seemann) 232. 1854, *nom. nov.* for *Cuspidaria* Fée and with the same type. **Figure 9.**

Cuspidaria Fée, Mém. Soc. Mus. Nat. Hist. Strasbourg 4: 201. 1850, not DC. 1838. TYPE: *Cuspidaria furcata* (L.) Fée (*Pteris furcata* L.) = *Dicranoglossum furcatum* (L.) John Sm.

Eschatogramme C. Chr., Bot. Tidsskr. 26(2): 285. 1904.

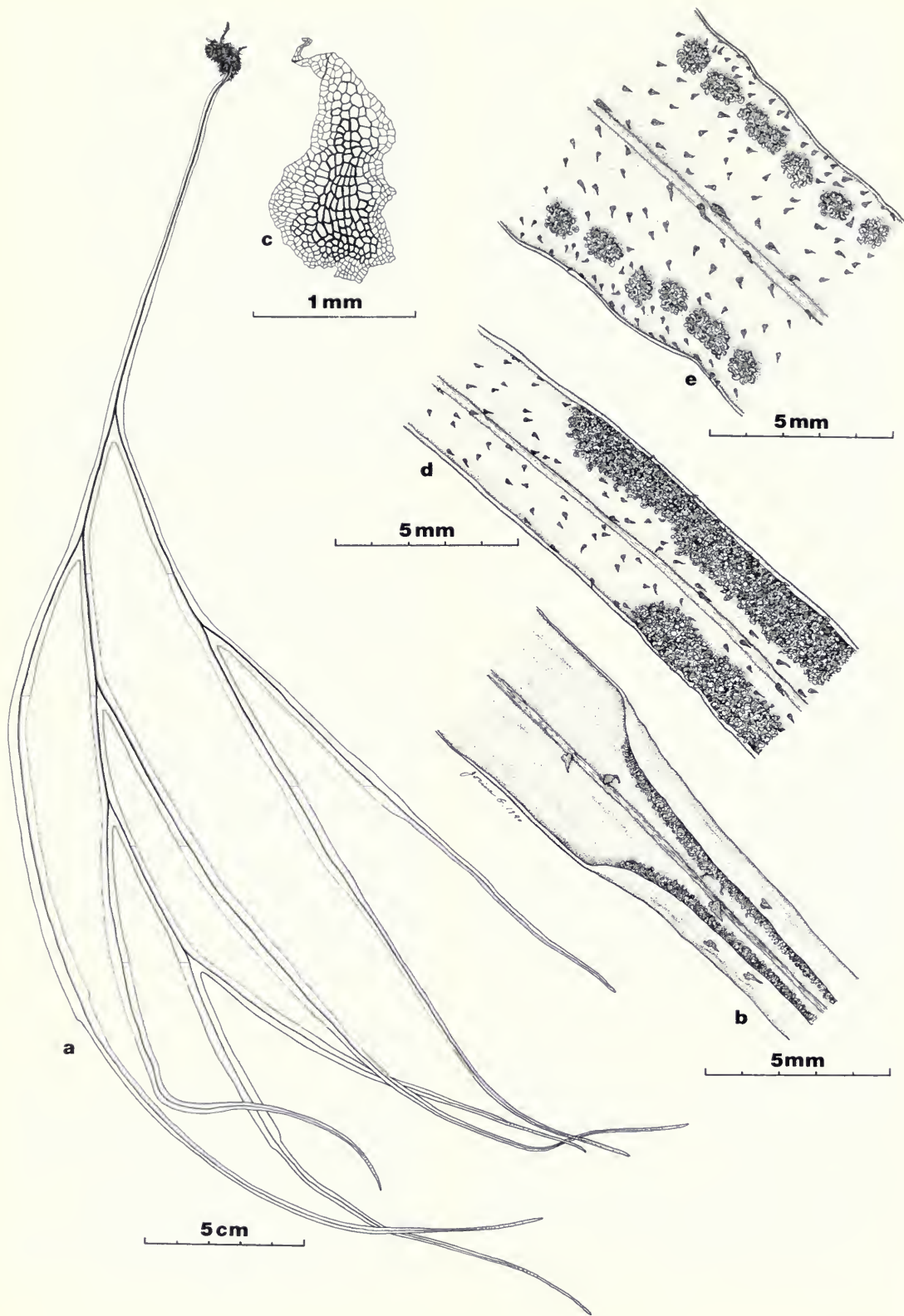
Plants epiphytic. **Stem** small, short-creeping, bearing clathrate scales and fibrous roots. **Leaves** monomorphic, loosely fasciculate, to 40 cm long, articulate to the stem, with petioles obsolete. **Lamina** attenuate at base, subdichotomously forked into 2 to several segments, or deeply pinnatisect and the 3–4 segments on either side strongly ascending, sparsely to copiously scaly. **Veins** free, or anastomosing without included free veinlets. **Sori** round and terminal on vein tips, or elongate, or in a long, inframarginal line the receptacle slightly raised, not paraphysate, exindusiate. **Spores** monolete, ellipsoid, with long laesura.

Dicranoglossum is a Neotropical genus of three to five species that are weakly distinguished by patterns of venation and size and shape of stem and laminar scales, and their taxonomy is still open to question. Some taxa (e.g., *D. subnudum*) have laminae so thick that the venation pattern can only be seen by the laborious process of clearing. In other taxa, leaves must be held to strong light to observe the veins. Authors have separated other species according to apparent differences in size, shape, and frequency of laminar scales, which, however, tend to be highly variable. These scales typically are minute and circular, sometimes sparse, sometimes copious. Some have short cusps, others have a long, attenuate apex, and there are intermediate gradations.

Sporangia typically are borne on a long, narrow receptacle served by a vascular commissure, but in *D. polypodioides* the receptacle is usually confined to the vein tips, with sori more or less round and discrete. Sporangia of *D. panamense* (C. Chr.) Gómez (Central America and northern South America) are generally in long lines, but these sometimes grade into separate sori and the two species may be synonymous. See *D. polypodioides* for further discussion.

References

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- TRYON, R. M., AND A. F. TRYON. 1982. *Dicranoglossum*, pp. 708–711. In *Ferns and Allied Plants*. Springer-Verlag, New York.



Key to Species of *Dicranoglossum*

- a. Stem scales obviously bicolorous, reddish-brown with a conspicuous, black, central band; laminar scales few and scattered or lacking; lamina subcoriaceous and the veins obscure . . . 1. *D. subnudum*
- a. Stem scales essentially concolorous, dark gray- or red-brown; laminar scales abundant; lamina firm-herbaceous to chartaceous and veins mostly visible when backlighted b
- b. Veins anastomosing, forming costal areoles; sporangia in continuous lines (coenosori); rachis and costae darker than adjacent tissue, at least in the proximal half of the lamina . . . 2. *D. desvauxii*
- b. Veins of sterile portion of lamina free; sporangia round or oblong, mostly discrete (some confluent at maturity); rachis and costae lighter in color than laminar tissue, stramineous nearly throughout 3. *D. polypodioides*

1. *Dicranoglossum subnudum* (C. Chr.) Stolze, *comb. nov.* Figures 9a-c.

Eschatogramme furcata var. *subnuda* C. Chr., Dansk Bot. Ark. 6(3): 36. 1929. TYPE: Bolivia, Nordyungas, Polo Polo near Coroico, *Buchtien 3586* (holotype, us!; isotypes, F!, K).

Eschatogramme subnuda (C. Chr.) Copel., Univ. Calif. Publ. Bot. 19: 305. 1941.

Stem scales 1–2 mm long, lanceolate to ovate, acuminate, conspicuously bicolorous, reddish-brown, with a narrow to broad, black, often lustrous, central band of cells. **Leaves** 15–40 cm long, 10–20 cm broad. **Lamina** subdichotomously divided into 2–4 segments, these often once again forked, subcoriaceous, naked, or with a few scales widely scattered on the abaxial side, these 0.4–0.8 mm long, lanceolate. **Rachis** and costae red- or gray-brown, abaxially, obviously darker than the adjacent laminar tissue, rarely lighter distally. **Ultimate segments** 3–7 mm broad, fertile portions contracted and the margins usually revolute. **Veins** obscure, 1–2-forked, essentially free. **Sporangia** in submarginal, linear coenosori on the distal portion of segments.

Pendent from tree trunks or branches, in deep forests, 700–1550 m, Amazonas, Huánuco, and Junín.

Peru; Bolivia.

Mr. J. K. Sommer, University of Utrecht, The Netherlands, had proposed the new combinations of *D. subnudum* as part of his monograph of the genus. Sadly, due to his untimely death in 1989, this work was not published, so the new combination is published here.

Christensen (1929) separated *D. furcatum* into several varieties, including vars. *bicolor* and *subnudum*. However, the bicolorous stem scales of the last two more clearly separate them from *D. furcatum* than the highly variable laminar scales distinguish *D. furcatum* from *D. polypodioides* or *D. panamense*. Hence, *D. subnudum* is here elevated to the level of species. Specimens from Columbia, designated by Christensen as var. *bicolor*, apparently differ from *D. subnudum* only in the numerous laminar scales and probably should be treated as a form of the latter.

Amazonas: Prov. Bagua, Cerro Tapur on Río Utcubamba. *Hutchison 1488* (UC). **Huánuco:** Tingo María to Pucallpa, *Ellenberg 3895* (GH). Prov. Huánuco, Cotirarda, *Mexia 8220* (F, GH, US). **Junín:** Prov. Tarma, Chanchamayo, *Esposito, USM cat. no. 11023* (USM). La Merced, Jardín el Perezoso, *León 267* (GH, USM). La Merced, Hacienda Schunke, *Macbride 5658* (F, US). Chanchamayo Valley, *C. Schunke 113* (F).

2. *Dicranoglossum desvauxii* (Klotzsch) Proctor. *Rhodora* 63: 35. 1961. Figure 9d.

Taenitis desvauxii Klotzsch, Linnaea 20: 431. 1847. LECTOTYPE (designated by Proctor, Flora Lesser Antilles 348. 1977): Hooker & Greville, Icon. fil. 1, t. 7. 1827, based on a *Guilding* specimen from St. Vincent.

Eschatogramme desvauxii (Klotzsch) C. Chr., Dansk Bot. Ark. 6(3): 37. 1929.

Stem scales about 1 mm long, ovate, essentially concolorous, dark brown or blackish, rarely slightly lighter in color just at the margin. **Leaves** 8–38 cm long, 5–14 cm broad. **Lamina** firm-herbaceous to (occasionally) chartaceous, abundantly scaly

FIG. 9. *Dicranoglossum subnudum*: a, habit; b, portion of fertile pinna; c, stem scale. *Dicranoglossum desvauxii*: d, portion of fertile pinna; *Dicranoglossum polypodioides*: e, portion of fertile pinna. (a, b, c from *Mexia 8220*, F; d from *Hutchison & Wright 3726*, GH; e from *Simpson 482*, F.)

abaxially, scales on the laminar tissue circular and 0.1 mm in diameter, or with a cusp as long as the scale body. **Rachis and costae** red- or gray-brown, obviously darker than the adjacent laminar tissue, sometimes lighter distally, provided with a few scattered, lanceolate, clathrate scales to 1 mm long. **Ultimate segments** 5–12 mm broad, fertile portions sometimes slightly contracted, the margins plane, rarely revolute. **Veins** indistinct, but commonly evident when held to light, merging to form elongated costal areoles. **Sporangia** in continuous, narrow, inframarginal lines (coenosori) in the distal portions of segments.

In wet forests and wooded ravines, on tree trunks and branches, 375–850 m, Amazonas and Loreto, south to Pasco, Madre de Dios.

St. Vincent; Trinidad; Columbia to the Guianas, south to Bolivia and Brazil.

In *Dicranoglossum desvauxii* segments tend to be more numerous than in other species—often three or four on each side. Yet even the basal ones are so long and strongly ascending as to reach near the tip of the apical segment. Thus, the general aspect of the lamina is still of a subdichotomous pattern. This is the only species in the genus having veins of sterile portions of segments merging to form costal areoles.

Amazonas: Prov. Bagua, 5.5 km NE of Montenegro, *Hutchison & Wright* 3726 (GH, UC). Prov. Bagua, Río Maraón above Cascades de Mayasi, *Wurdack* 1855 (US). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, Quebrada de Yacu Sisa, *Schunke* V. 7554 (F, UC). **Loreto:** Prov. Maynas, Quebrada Sucusari, *Vásquez & Jaramillo* 11838 (F, MO). **Huánuco:** 5 km NE of Tingo María, *Stork & Horton* 9517 (F, GH, UC, US). Prov. Huánuco, Tingo María, *Tryon & Tryon* 5226 (GH, US, USM). **Pasco:** Puerto Bermúdez (as Junín), *Killip & Smith* 26417 (F, US). Prov. Oxapampa, Valle de Palcazú, near Iscozacín, *León* 709 (F, USM). **Madre de Dios:** Prov. Manú, Río Alto Madre de Dios, near Atalaya, *Foster & Baldeon* 12854 (F).

3. *Dicranoglossum polypodioides* (Hooker) Lelinger, Selbyana 2: 283. 1978. **Figure 9e.**

Taenitis furcata var. *polypodioides* Hooker, Sp. fil. 5: 188. 1864. TYPE: Ecuador, base of the Andes on road to Guayaquil, *Jameson* (holotype, K).

Eschatogramme polypodioides (Hooker) C. Chr., Dansk Bot. Ark. 6(3): 38. 1929.

Stem scales 1–2 mm long, lanceolate to ovate, dark brown or blackish, rarely slightly lighter in color just at the margin, **Leaves** 12–30 cm long, 4–8 cm broad. **Lamina** subdichotomously divided

into 2–4 segments, these often once again forked, firm-herbaceous to chartaceous, abundantly scaly abaxially, scales on the laminar tissue circular and 0.1 mm in diameter, or with a cusp as long as the scale body. **Rachis and costae** lighter in color than the laminar tissue, stramineous throughout (or rachis darker near the base), provided with a few, scattered, lanceolate, clathrate scales to 1 mm long. **Ultimate segments** 4–12 mm broad, fertile portions sometimes slightly contracted, the margins plane, not revolute. **Veins** indistinct, but commonly evident when held to light, 1–2-forked, free. **Sporangia** grouped in round or oblong, discrete sori (occasionally some of these confluent on very mature leaves), borne on distal portions of segments.

Pendent on trees and shrubs in thickets and forests, 600–800 m, Tumbes.

Western Ecuador; northern Peru.

Dicranoglossum polypodioides is very similar to *D. furcatum* (L.) John Sm., s.s. (West Indies, northern South America) and *D. panamense* (C. Chr.) Gómez (Central America, northern South America). The diagnostic characters separating these are mostly variable: *D. polypodioides* has discrete sori, mostly stramineous midribs, and abundant laminar scales; *D. panamense* has linear coenosori, mostly stramineous midribs, and abundant laminar scales; and *D. furcatum* has linear coenosori, mostly dark midribs, and more scattered laminar scales. Some gradation toward either discrete or confluent sori has been observed in the former two species, and relative frequency of scales is not a strong diagnostic character in the latter two. Thus, *D. panamense* seems to be intermediate between the others, but further study is needed to determine whether the three taxa are distinct or merely variable forms of one species.

Tumbes: Prov. Zarumilla, Dist. Matapalo, Bosque Nacional de Tumbes, *Schunke* V. 2373 (F, GH), *Simpson & Schunke* V. 482 (F, GH).

VI. *Microgramma*

Microgramma Presl, Tent. pterid. 213. 1836. TYPE: *Microgramma persicariifolia* (Schrader) Presl (*Polypodium persicariifolium* Schrader). **Figure 10.**

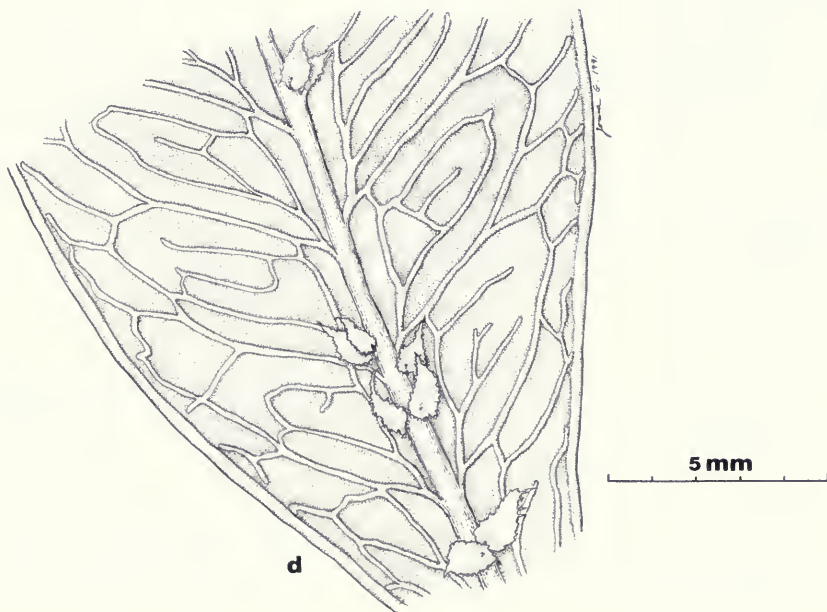
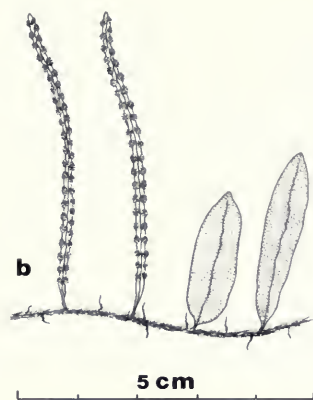
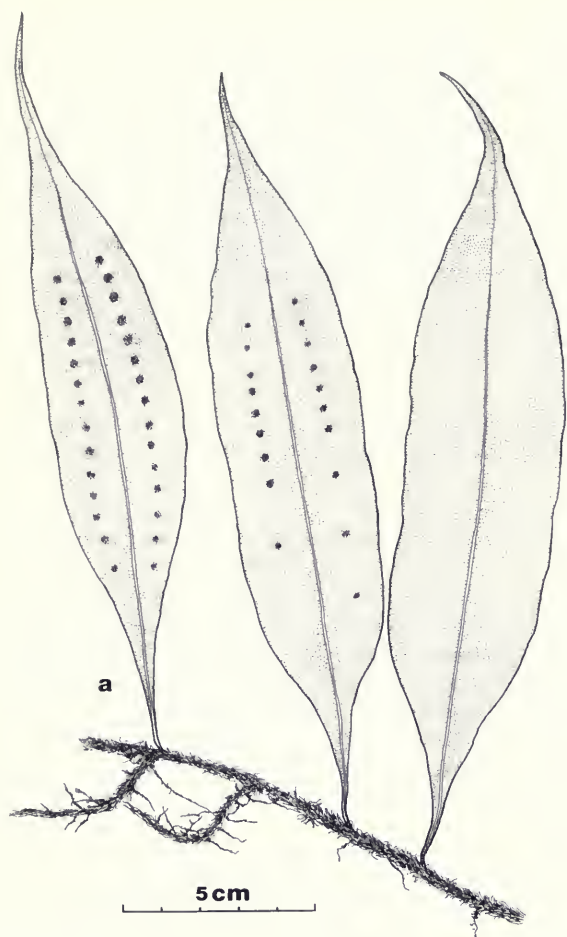
Plants epiphytic or epipetric. **Stem** long-creeping, usually somewhat flattened, bearing peltately

attached, nonclathrate scales and few to many fibrous roots. **Leaves** monomorphic to dimorphic, articulate on short phyllopodia, widely spaced. **Lamina** simple and essentially entire, glabrous to slightly pubescent, sparsely to abundantly scaly, the scales not or scarcely clathrate, peltately attached, variously shaped, but not circular. **Veins** free to anastomosing, areoles lacking or (usually) with free, included veinlets. **Sori** round, or elongate in a few species, borne in a single row on each side of the costa on or usually at the tip of a vein or junction of veins, on a scarcely to somewhat raised receptacle, paraphyses (if present) not peltate. **Spores** monolete, ellipsoid, with long laesura.

This ill-defined genus contains about 20 American species, plus one or two more in Africa, Madagascar, and the Mascarenes. There are 14 known from Peru. A number of species have goniophleboid venation, as in *Polypodium*, and there is also a close relationship with *Pleopeltis*. Monographic study is sorely needed to ascertain proper relationships. For further elaboration of the problems, see discussion under the genus *Pleopeltis*, and treatment of *P. fuscopunctata*.

Key to Species of *Microgramma*

- a. Scales ample and conspicuous on costa and laminar tissue, at least abaxially, sometimes long and hairlike from an expanded base b
- b. Leaves not or only slightly dimorphic c
 - c. Veins, especially of sterile leaves, free; laminar scales ovate to lanceolate, acuminate to attenuate, but not abruptly filiform-tipped; lamina base attenuate 1. *M. chrysolepis*
 - c. Veins anastomosing, forming 1(–2) series of areoles between costa and margin; laminar scales mostly filiform from an abruptly expanded base; lamina base obtuse or cuneate 2. *M. latevagans*
- b. Leaves conspicuously dimorphic, the sterile 2–6 times broader than fertile ones d
- d. Scales on abaxial lamina surface whitish, filiform and tortuous, most of them stellately branched 3. *M. vacciniifolia*
- d. Scales on abaxial lamina surface orange to castaneous, tips rigid and setiform, or filiform and rather straight, not tortuous e
- e. Fertile lamina 1.5–2 mm broad, mature sori commonly projecting beyond the margin; stem scales somewhat appressed to spreading 5. *M. reptans*
- e. Fertile lamina 3–6 mm broad, sori well contained within the margins; stem scales either tightly appressed or obviously spreading f
- f. Sterile lamina 4–8.5 cm long; laminar scales linear-deltate from a scarcely expanded base; stem scales tightly appressed, the tips not filiform, or if slightly filiform, then not or rarely spreading 4. *M. piloselloides*
- f. Sterile lamina 0.8–2(–2.5) cm long; lamina scales setiform from an abruptly expanded base; stem scales spreading, the tips filiform 6. *M. tecta*
- a. Scales essentially lacking on laminar tissue between costa and margin g
- g. Fertile leaves (1.3–)2–9 cm broad, broadly lanceolate or elliptic, the apex acuminate to attenuate h
- h. Stem 10–40 mm broad; sori mostly inframedial; leaves 24–40 cm long 13. *M. megalophylla*
- h. Stem 1–3 mm broad; sori mostly medial; leaves to 21 cm long i
- i. Sori elongate to linear; primary veins much thicker and more prominent than the others 14. *M. persicariifolia*
- i. Sori round; primary and other veins equally prominent 12. *M. thurnii*
- g. Fertile leaves 0.2–1(–1.5) cm broad, linear to linear-lanceolate, the apex obtuse to subacute, rarely acute j
- j. Leaves not or only slightly dimorphic; included free veinlets both recurrent and excurrent within areoles k
- k. Petiole 5–15 mm long; stem commonly more than 2 mm (to 5 mm) in diameter, the scales



whitish from a castaneous base, with an attenuate tip; sori medial to (mostly) inframedial

..... 7. *M. rosmarinifolia*

k. Petiole obsolete; stem commonly less than 2 mm in diameter, the scales orange to castaneous (sometimes aging whitish), with a filiform tip; sori medial to (mostly) supramedial 1

l. Veins (at least primary ones) distinct, more or less prominulous; sori not or slightly immersed; lamina chartaceous to subcoriaceous, plane 8. *M. lycopodioides*

l. Veins all obscure (at least abaxially); sori deeply immersed; lamina coriaceous, the margins mostly strongly revolute 9. *M. baldwinii*

j. Leaves conspicuously dimorphic, sterile ones 2–5 times as broad as the fertile and often sometimes shorter; included free veinlets lacking or few and only excurrent within areoles m

m. Sterile leaves 1–4(–6) cm long, circular to broadly elliptic, the base cuneate 3. *M. vacciniifolia*

m. Sterile leaves (4–)5–11 cm long, lanceolate to narrow-elliptic, the base attenuate n

n. Costa scales broad; sori medial; stem scales ciliate 10. *M. squamulosa*

n. Costa scales mostly filiform; sori subcostal to inframedial; stem scales denticulate

..... 11. *M. ulei*

1. *Microgramma chrysolepis* (Hooker) Crabbe,
Brit. Fern Gaz. 9: 316. 1967.

Polypodium chrysolepis Hooker, Icon. pl. 8: t. 721.
1845. TYPE: Ecuador, Andes of Quito, *Jameson*
37 (in error in the protologue as “73”) (holotype,
k!; photo, us).

Plants epiphytic, or sometimes epipetric. **Stem** (excluding scales) to 1 mm in diameter, provided with dense, spreading scales, these 4–6 mm long, linear-lanceolate and attenuate to a filiform tip, peltately attached above the base, orange, or whitish in age, with a castaneous point where attached, margins entire to denticulate. **Leaves** chartaceous to subcoriaceous, abundantly scaly throughout, essentially monomorphic, subsessile to conspicuously stalked. **Petiole** 2–12 mm long. **Lamina** lanceolate or elliptic-lanceolate, 3–10(–14) cm long, 0.6–1.7 cm broad, apex acute, or more commonly subacute, base attenuate, margin entire to slightly sinuate, scales ovate to lanceolate, acuminate to attenuate. **Veins** (especially of sterile leaves) free, 1–2-forked, indistinct or obscure. **Sori** round or slightly elongated, more or less medial, sporangia intermixed with, and sometimes covered by, ovate, acuminate, orange scales.

In and at edges of dense or open forests, on tree trunks and branches, sometimes on mossy boulders, (1800–)2600–4100 m, Amazonas, La Libertad, Ancash, Huánuco, and Cuzco.

Ecuador; Peru; Bolivia; Argentina.

This is the only species of *Microgramma* in Peru with predominantly free veins. The character of venation is the principal reason it is maintained in the genus *Polypodium* by Sota and Pérez-García (Biotica 7: 45–64. 1982). It occurs mostly above 2500 m, although *Macbride 3826* Huánuco (cited below) was collected at 1800 m.

Amazonas: Approaches to Cerro Campanario NNE of Diosan, *Wurdack 1592* (GH, US). **La Libertad:** Prov. Huamachuco, between Pallar and Huaguil, *López & Sagástegui 8129* (F, HUT). **Ancash:** Prov. Huari, Huascarán National Park, *D. Smith et al. 12415* (F, HUT, MO), *12648* (F, MO). **Huánuco:** Yanano, *Macbride 3826* (F, US). **Cuzco:** Huayocari to Yanococha, Urubamba, *Núñez et al. 6988* (F, MO). Prov. Urubamba, Hacienda Huayockayí, *Vargas 14983* (GH).

2. *Microgramma latevagans* (Maxon) Lell., Amer.
Fern J. 74: 59. 1984.

Polypodium latevagans Maxon, Proc. Biol. Soc. Wash.
52: 120. 1939. TYPE: Bolivia, Unduavi, *Rusby*
361 (holotype, US!; isotype, NY; photo, F of US).

Plants epiphytic, rarely epipetric. **Stem** (excluding scales) less than 1 mm in diameter, provided with dense, spreading scales, these 4–6 mm long, linear-lanceolate and attenuate to a filiform tip, peltately attached above the base, orange, often castaneous at base, or whitish in age, margins entire to denticulate. **Leaves** chartaceous, abundant-

FIG. 10. *Microgramma thurnii*; a, habit. *Microgramma reptans*; b, habit, fertile and sterile leaves; c, lamina scales. *Microgramma squamulosa*; d, base of sterile lamina. (a from *S. F. Smith et al. 981*, GH; b from *Klug 366*, F; c from *Killip & Smith 22951*, GH; d from *Soukup & López 14751*, GH.)

ly scaly throughout, essentially monomorphic, or fertile ones slightly smaller, short- to long-stalked. **Petiole** 3–15 mm long. **Lamina** ovate to narrow-lanceolate, 1–5 cm long, 0.5–1.5 cm broad, apex acute or subacute, base obtuse or cuneate, margin entire, scales mostly filiform from an abruptly expanded base. **Veins** merging to form 1(–2) rows of areoles on each side of the costa, indistinct or obscure. **Sori** round or elongated, often confluent at maturity, inframedial or subcostal, sporangia intermixed with filiform orange scales.

In forests, growing on tree trunks and branches, very rarely on rocks, (200–)650–2250(–2420) m, Cajamarca, San Martín, Loreto, Pasco, Puno.

Besides the characters in the key, this also can be distinguished from *M. chrysolepis* by the sori, which usually crowd the costa, whereas sori of the latter are essentially medial. Also, *M. chrysolepis* grows at much higher elevations, usually above 2500 m, while *M. latevagans* usually occurs below 2300 m.

Cajamarca: Prov. Cutervo, Parque Nacional San Andres, *López & Sagástegui 5551* (GH, HUT, UC). Prov. Santa Cruz, above Charro Blanco, *Sagástegui et al. 13008* (F, HUT). **San Martín:** 23 km S of Nuevo San Martín, *Gentry et al. 37604* (F, MO). **Loreto:** Prov. Maynas, near Brilla Nueva on upper Río Yaguasyacu, *Gentry & Reville 20472* (MO, USM). **Pasco:** Palcazú Valley, Iscozacín, *Salick 7135* (F). **Puno:** Prov. Sandia, near Sandia, *Vargas 14801* (GH).

3. *Microgramma vacciniifolia* (Langsd. & Fisch.) Copel., Gen. fil. 185. 1947.

Polypodium vacciniifolium Langsd. & Fisch., Icon. fil. 8. 1810. TYPE: Brazil, Santa Catarina Island, *Langsdorff 6/7* (holotype, LE; isotype, B, *Herb. Willd.* 19600; photos, F & GH of B).

Plants epiphytic, rarely epipetric. **Stem** 3–5 mm in diameter, completely covered by appressed, densely imbricate scales, or the tips often spreading, the scales 3–7 mm long, lanceolate, attenuate to a filiform tip, peltately attached above the base, castaneous, usually with a blackish point where attached, tips orange to tawny, or whitish in age, margins denticulate. **Leaves** chartaceous to subcoriaceous, moderately scaly along costa abaxially, laminar surface abaxially naked or often with scattered to abundant, tortuous, filiform scales, conspicuously dimorphic, sessile or subsessile. **Petiole** 0–2 mm long. **Lamina** obtuse to subacute, fertile ones 3–10 cm long, 0.2–0.4(–0.6) cm broad, linear, with attenuate base, sterile ones 1–4(–6) cm long, 0.8–1.7 cm broad, circular to broadly elliptic or

oblong-elliptic, cuneate at base. **Veins** areolate, included free veinlets lacking, or in sterile leaves these present and excurrent, indistinct, not or scarcely prominulous. **Sori** round, medial or inframedial, sporangia usually intermixed with long, pale, filiform paraphyses.

Rare in Peru, in forests, on tree trunks or on rocks, 480–1100 m, Cajamarca, Amazonas, Huancavelica.

Jamaica; Grenada; Trinidad & Tobago; Venezuela and Columbia south to Paraguay and Argentina.

On the lamina are usually found what appear to be pale trichomes but which are actually filiform scales. These are attached by a nearly circular, peltate base and are abruptly reduced to a tortuous, hairlike scale body. They are commonly on the costa and intermixed among the sporangia, but on a few specimens they are abundant over the abaxial surface of the lamina. Those on the laminar surface are often stellately branched from the base, with several greatly elongated and tortuous arms appearing like very thin tentacles. Apparently they are easily abraded, for on some mature specimens they are virtually lacking.

Cajamarca: Colasay, *Woytkowski 6938* (MO, US). **Amazonas:** Prov. Bongará, between Bongará Grande and El Ingenio, *Sagástegui 5949* (GH, HUT). Prov. Bongará, Jazán, above Río Utcubamba, *Young et al. 500* (MO, UC). **Huancavelica:** Prov. Tayacaja, above Virgen-pampa, E of Tintay, *Tovar 4601* (GH). Prov. Tayacaja, mouth of Imaybamba, SE of Tintay, *Tovar 4613* (GH).

4. *Microgramma piloselloides* (L.) Copel., Gen. fil. 185. 1947.

Polypodium piloselloides L., Sp. pl. 2: 1083. 1753.

TYPE: "Habitat in America Meridionali" (probably from Martinique) (holotype, LINN 1251.3).

Microgramma acatallala Alston, J. Wash. Acad. Sci. 48: 232. 1958. TYPE: Columbia, Putumayo, Río Mocoa drainage, *Ewan 16706* (holotype, BM; isotypes, GH!, MO, UC!, US!).

Plants epiphytic. **Stem** 0.6–1 mm in diameter, amply provided with and sometimes obscured by tightly appressed scales, these 2–4 mm long, peltately attached near the base, broadly lanceolate and often attenuate but the tips not filiform or spreading, orange or tawny, with a castaneous point where attached, margins subentire. **Leaves** chartaceous, amply scaly, conspicuously dimorphic (at least in Peru), short-petiolate. **Petiole** 0.3–0.6 cm long. **Sterile lamina** 4–8.5 cm long, 1–1.8 cm broad,

lanceolate or oblong-lanceolate, apex acute or subacute, base cuneate, provided throughout with minute, appressed scales, these orange to tawny, often whitish on the adaxial surface, linear-deltate from a slightly expanded peltate base to a setiform tip; **veins** indistinct to obscure, merging to form 1(–2) rows of areoles on each side of the costa, costal areoles each with a free, excurrent veinlet. **Fertile lamina** linear to very narrow-lanceolate, attenuate at base, (2.5–)4–10 cm long, 0.3–0.6 cm broad, sori round, inframedial, sporangia intermixed with abundant, orange or ferruginous, filiform scales.

In wet forests, on tree trunks and branches, 100–700 m, Amazonas, San Martín, and Loreto.

Southern Mexico (Chiapas); Guatemala; West Indies; Columbia to Guyana, south to Bolivia and Brazil.

In addition to the characters of the key, this usually can be distinguished from *M. tecta* and *M. reptans* by the often whitish scales on the adaxial lamina surface. Adaxial scales of the other two are orange to castaneous. Stem scales of *M. piloselloides* are also diagnostic in this species complex. Most of them are broad and tightly appressed to the stem from base to tip, whereas scales of *M. reptans* are only loosely appressed, with widely spreading tips, and those of *M. tecta* are filiform and strongly spreading.

The shape of fertile leaves of *M. piloselloides* is variable in the West Indies and Central America, in some plants conspicuously longer and narrower than the sterile ones, but in others less obviously so. Alston separated *M. acatallela* from *M. piloselloides* based on strong vs. slight dimorphism, but he pointed out no other substantiating characters. *Mexia 6144b* (Loreto) was cited as a paratype of *M. acatallela*.

Amazonas: Prov. Bagua, Río Marañón opposite Quebrada Miranán, *Wurdack 2035* (US). **San Martín:** Prov. Lamas, trail to Río Tiriayacu and Río Cashiyacu, *Knapp & Mallet 7209* (F, MO). **Loreto:** San Antonio, on Río Ataya, *Killip & Smith 29356* (F, US). Mishayacu, near Iquitos, *Klug 2539* (F, GH, US). Pongo de Manseriche, bank of Río Santiago, *Mexia 6144b* (BM, GH, US).

5. *Microgramma reptans* (Cav.) A. R. Smith, Proc. Calif. Acad. Sci. IV, 40: 230. 1975. **Figures 10b–c.**

Acrostichum reptans Cav., Anales Hist. Nat. 1: 104. 1799. TYPE: Ecuador, Prov. Guayas, Guayaquil, Née (holotype, MA).

Polypodium ciliatum Willd., Sp. pl. ed. 4, 5: 144. 1810.

TYPE: Brazil, Para, Hoffmannsegg (holotype, B, Herb. Willd. 19601; photo, GH).

Microgramma ciliata (Willd.) Alston, Bull. Jard. Bot. Etat. 27: 56. 1957.

Plants epiphytic, rarely epipetric. **Stem** 0.4–0.7 mm in diameter, amply to moderately provided with (but not obscured by) weakly appressed to spreading scales, these 2–4 mm long, linear-lanceolate and attenuate to a filiform tip, peltately attached above the base, orange to castaneous, margins essentially entire. **Leaves** chartaceous, amply scaly, conspicuously dimorphic, subsessile to short-petiolate. **Petiole** 0.2–0.7 cm long. **Sterile lamina** 1.5–5 cm long, 0.8–1.5 cm broad, ovate, elliptic, oblanceolate or oblong, apex acute or subacute, base narrowly to broadly cuneate, rarely obtuse, provided throughout with minute, appressed scales, these mostly orange to castaneous, setiform to abruptly attenuate from an expanded, peltate base; **veins** obscure, merging to form 1(–2) rows of areoles on each side of the costa, costal ones with a free, excurrent veinlet. **Fertile lamina** linear, attenuate at base, 2–5(–7) cm long, 0.15–0.22 cm broad, sori round, at maturity filling the lamina between costa and margin or, more commonly, projecting well beyond the margin, sporangia amply intermixed with orange, acicular scales.

In or at edges of forests, on trunks or branches of trees, once reported (*Macbride 5582*, Junín) growing on a rocky cliff, 100–650(–1200) m, San Martín and Loreto south to Ayacucho and Puno.

Southern Mexico to Panama; Trinidad and Tobago; Columbia to the Guianas, south to Bolivia and Brazil.

The large sori projecting over the margins of the very narrow fertile lamina easily distinguishes this from the other species of *Microgramma* in Peru, but specimens containing only sterile laminae could be confused with those of *M. tecta*. However, in the latter the sterile lamina is rarely more than 2 cm long and the base is usually truncate, or even subcordate, and the stem scales are mostly conspicuously spreading. In *M. reptans* the sterile lamina is commonly over 2 cm long and with a cuneate base, and stem scales are usually somewhat appressed in the proximal half.

San Martín: Prov. Lamas, km 2 of road from Pongo de Cainarache to Barranquita, *Knapp 8150* (F, MO). **Loreto:** Bank of Río Santiago above Pongo de Manseriche, *Mexia 6144* (F, GH, UC, US). **Huánuco:** Prov. Pachitea,

Dist. Honoria, Bosque Nacional de Iparia, *Schunke* V. 2010 (F, GH). **Pasco:** Prov. Oxapampa, Quebrada Castilla on Río Omaiz, *León & Young* 1019a (MO, USM). **Junin:** La Merced, *Macbride* 5582 (F, GH, US). **Ayacucho:** Río Apurímac Valley, near Kimpitiriki, *Killip & Smith* 22951 (F, GH, US). **Cuzco:** Río Tambopata, 2 km E of Colpa de Guacamayos, *Núñez* 6516 (MO). **Madre de Dios:** Prov. Tambopata, Albergue Cuzco Amazónico, *León* 859 (USM). **Puno:** Below San Gabán on Río San Gabón, *Dillon et al.* 1223 (F, MO, USM).

6. **Microgramma tecta** (Kaulf.) Alston, J. Wash. Acad. Sci. 48: 232. 1958.

Polypodium tectum Kaulf., Enum. fil. 87. 1824. TYPE: Brazil, Ilha de Santa Catarina, *Chamisso* (LE).

Plants epiphytic. **Stem** 0.3–0.5 mm in diameter, amply provided with (but not obscured by) spreading scales, these 2–3 mm long, peltately attached near the base, linear and gradually attenuate to a filiform tip, orange to castaneous, with a blackish point of attachment, margins entire. **Leaves** firm-herbaceous to chartaceous, amply scaly, conspicuously dimorphic, short- to long-petiolate. **Petiole** 0.2–2 cm long. **Sterile lamina** 0.8–2(–2.5) cm long, 0.5–1.3 cm broad, ovate to oblong-elliptic, to nearly circular, apex obtuse or subacute, base broadly cuneate, truncate or subcordate, provided throughout with minute, appressed scales, these orange, and setiform from an abruptly expanded, nearly circular base; veins obscure, merging to form 1(–2) row of areoles on each side of the costa, costal areoles with a free, excurrent veinlet. **Fertile lamina** linear to very narrow-elliptic or -oblanceolate, attenuate at base, 1.6–5 cm long, 0.3–0.5 cm broad, sori round, inframedial, sporangia intermixed with abundant, orange, long, filiform scales.

In forests, on tree trunks and branches, or twining among lianas, 100–1350 m, Amazonas, San Martín, Loreto, Huánuco, and Junín.

Columbia to the Guianas, south to Bolivia and Brazil.

Some specimens were separated by Mickel and Beitel (Pterid. Fl. Oaxaca 251. 1988) as var. *nana*, said to differ from var. *tecta* by somewhat narrower lamina scales. This, *M. piloselloides*, and *M. reptans* form a closely knit complex of species with scaly, strongly dimorphic laminae. See treatments of the others for further comparisons.

Amazonas: Prov. Bagua, between Aramango and Montenegro, Río Marañón, *López et al.* 4164 (GH, HUT), 4222 (GH, HUT). Prov. Bagua, Río Marañón opposite Quebrada Miranán, *Wurdack* 2037 (F, GH, UC, US). **San Martín:** San Roque, *Ll. Williams* 7531 (F, US). **Loreto:**

Soledad, on Río Itaya, *Killip & Smith* 29806 (F, GH, US). Prov. Maynas, Dist. Pebas, Río Ampiyacu, *Revilla* 864 (F, MO, US, USM). **Huánuco** (as San Martín): Tingo María, *Allard* 22569 (GH, US). **Junin:** Colonia Perené, *Killip & Smith* 25086 (US).

7. **Microgramma rosmarinifolia** (Kunth) R. & A. Tryon, *Rhodora* 84: 129. 1982.

Polypodium rosmarinifolium Kunth, Syn. pl. 1: 71. 1822. TYPE: Peru?, “Crescit in crepidinibus et ad arbores locis frigidis, alt. 1300 hex.,” *Kunth* (holotype, P; photos, GH, US).

Polypodium kunthii Desv., Prodr. 226. 1827. TYPE: type citation the same as for *Polypodium rosmarinifolium*, collector unspecified, but probably *Kunth* (holotype, P; photos, GH, US). This fragment very likely was cut from the *Kunth* type of *P. rosmarinifolium*. See Weatherby for discussion (Contr. Gray Herb. 124: 17. 1939).

Plants epiphytic, occasionally epiphytic. **Stem** 2–5 mm broad, completely covered by appressed, imbricate scales, these with tips spreading, 3–6 mm long, lanceolate, attenuate at apex, dull white, but castaneous at base, margins entire, or distally remotely ciliolate. **Leaves** 5–14(–20) cm long, 0.2–0.7(–1.0) cm broad, short-stalked, essentially monomorphic. **Petiole** 5–15 mm long. **Lamina** naked, subcoriaceous (rarely chartaceous), linear (rarely narrow-elliptic), obtuse to subacute, occasionally acute, the base attenuate. **Veins** obscure, areolate, the supracostal areoles each usually with a free, excurrent, veinlet, this bearing the sorus. **Sori** round, often slightly impressed, medial to inframedial, paraphyses sparse or lacking.

In forest, growing on or among rocks, or on tree trunks, Cajamarca, La Libertad, Cuzco.

Ecuador; Peru.

This species thus far is represented in herbaria by only a few collections. All but one were growing on rocks. The only epiphyte (*Sagástegui et al.* 10892) is much larger, with leaves to 20 cm long and 1 cm broad, and of thinner texture than the typical specimens.

Cajamarca: Prov. Contumazá, El Molino, *Sagástegui et al.* 10892 (F, HUT). **La Libertad:** Prov. Otuzco, road Casmiche to Otuzco, *Sagástegui* 6268 (GH, HUT). **Cuzco:** Valle de Paucartambo, *Herrera* 3001 (US). Prov. Paucartambo, Chacclabamba, *Vargas* 9453 (GH).

8. **Microgramma lycopodioides** (L.) Copel., Gen. fil. 185. 1947.

Polypodium lycopodioides L., Sp. pl. 2: 1082. 1753. TYPE: Probably West Indies, collector unknown

(holotype, LINN 1251.2). For a comprehensive list of basionyms, see Lellinger, *Pteridologia* 2A: 250. 1989.

Plants epiphytic. **Stem** 1.5–2 mm in diameter, completely covered by appressed, densely imbricate scales, these 3–6 mm long ovate to lanceolate-attenuate, with a filiform, often deciduous tip, petately attached above the base, castaneous to deep orange, sometimes whitish in age, usually with a black point where attached, margins setulose or sometimes ciliate. **Leaves** chartaceous to subcoriaceous, naked, monomorphic to slightly dimorphic (sterile ones a little broader), sessile, the petiole essentially obsolete. **Lamina** obtuse to subacute, rarely acute, (4.5–)6–14 cm long 0.6–1.3 cm broad, linear or linear-lanceolate, with attenuate base, the margins plane. **Veins** areolate, primary ones (at least) distinct and more or less prominulous, included free veinlets spreading in all directions. **Sori** round, medial or slightly supramedial, sporangia usually intermixed with occasional orange paraphyses.

In rain forests, climbing among shrubs or on branches and trunks of trees, 700–2000 m, Amazonas to Loreto, south to Cuzco and Puno.

West Indies; southern Mexico to Panama; Colombia to the Guianas, south to Bolivia and Brazil; Africa?

Microgramma baldwinii is very similar to this and might be considered a geographic and elevational variant. Throughout the range of distribution the species complex varies markedly in lamina width and texture, which apparently affects the ways in which sori and veins are immersed in the tissue and the way the margins are inrolled. In the West Indies the lamina is often firm-herbaceous and 2 cm broad, with margins perfectly plane and the veins conspicuous, and sori are clearly superficial. At the other extreme, in northern South America and at lower elevations in Peru (*M. baldwinii*), the lamina is much narrower, nearly coriaceous, with margins revolute, and veins and sori deeply immersed in the tissue. In central American specimens of *M. lycopodioides*, the lamina more closely resembles that in the West Indies, whereas at higher elevations in South America it approaches the character of *M. baldwinii*. Further study is needed, but the two taxa are treated here as distinct species.

Amazonas: Prov. Bagua, between Montenegro and Chiriaco, *Sagástegui* 5926 (GH, HUT). **San Martín:** Prov. Lamas, Dist. Lamas, below English Evangelical Mission,

Belshaw 3427 (F, GH, MO, UC, US). **Loreto:** Sierra del Pongo, *Mexia* 6276a (GH, UC, US). **Huánuco:** Prov. Huánuco, Dist. Churubamba, Hacienda Exito, *Mexia* 8227 (F, GH, UC, US). **Pasco:** Prov. Oxapampa, Abra los Mellizos, 4–8 km from Eneñas, *Skog et al.* 5045, in part (US). **Junín:** Chanchamayo Valley, *C. Schunke* 1545 (F, US). **Cuzco:** Paucartambo, between Chontachaca and Pilla-huata, *Núñez* 8107 (F, MO). **Puno:** Below San Gabán on Río San Gabán, *Dillon et al.* 1211 (F, USM).

9. *Microgramma baldwinii* Brade, Arch. Jard. Bot. Rio Janeiro 18: 30, t. 1. 1965. TYPE: Brazil, Amazonas, Marabitanas, Rio Negro, *Baldwin* 3229 (holotype, IAN; isotype, US).

Plants epiphytic, very rarely terrestrial. **Stem** long-creeping, 1–2 mm in diameter, completely covered by appressed, densely imbricate scales, these 3–4(–5) mm long, ovate to lanceolate-attenuate, with a filiform, often deciduous tip, petately attached above the base, castaneous to deep orange, sometimes whitish in age, usually with a blackish point where attached, margins entire to setulose. **Leaves** simple, entire, coriaceous, naked, monomorphic to slightly dimorphic (sterile ones a little broader), sessile, the petiole essentially obsolete. **Lamina** obtuse to subacute, rarely acute, (4–)6–12 cm long, 0.4–1 cm broad, linear to narrow-oblong, with attenuate base, the margins strongly revolute. **Veins** areolate, obscure, immersed in the tissue, included free veinlets both recurrent and excurrent within areoles. **Sori** round, borne in a single supramedial row on each side of the costa, sporangia usually intermixed with short, orange to castaneous paraphyses.

In forests, climbing on trunks and branches of trees, in a single collection terrestrial (*Wurdack* 1943), 100–850 m, Amazonas, San Martín, Loreto, Huánuco, Junín, Ucayali, and Cuzco.

Venezuela; Ecuador; Peru; Amazonian Brazil.

This is very similar to *M. lycopodioides*, and it is questionable if they are truly distinct species. See treatment of the latter for further discussion.

Amazonas: Prov. Bagua, between Aramango and Montenegro, *López et al.* 4213 (GH, HUT). Prov. Bagua, valley of Río Marañón near Cascadas de Mayasi, *Wurdack* 1943 (F, US). **San Martín:** Lamas, Santa Rosa de Davidcillo, *Knapp & Mallet* 8467 (F, MO). Mariscal Cáceres, Tocache Nuevo, *Schunke V.* 5744 (F, US). **Loreto:** Mishuyacu, near Iquitos, *Killip & Smith* 29901 (US), *Klug* 1194 (F, US). **Huánuco:** Prov. Leoncio Prado, Dist. Rupa Rupa, E of Tingo María, *Schunke V.* 10591 (F). **Junín:** Satipo, *León* 276 (USM). **Ucayali:** Prov. Requena, Jenaro Herrera, *Vásquez et al.* 2099 (F, MO). **Cuzco:** Prov. Paucartambo, Cosñipata Valley, N of Patria, *Foster et al.* 10617 (F).

10. *Microgramma squamulosa* (Kaulf.) Sota,
Opera Lilloana 5: 59. 1961. **Figure 10d.**

Polypodium squamulosum Kaulf., Enum. fil. 89. 1824.
TYPE: Brazil, Ilha de Santa Catarina, *Chamisso*
(LE).

Plants epiphytic or epipetric. **Stem** 2.5–4 mm in diameter, completely covered by appressed, imbricate scales, or the tips of these often spreading, the scales 3–6 mm long, lanceolate, attenuate to a filiform tip, petately attached above the base, castaneous, with a blackish point where attached, tips usually whitish, often delicate and worn away, margins usually ciliate. **Leaves** chartaceous to subcoriaceous, naked except for scattered, broad, ciliate scales on costa, conspicuously dimorphic, sessile to short-stalked. **Petiole** 1–10 mm long. **Lamina** obtuse to subacute, the base attenuate, fertile ones 5–12 cm long, 0.2–1 cm broad, linear, sterile ones 4–10 cm long, 1–2 cm broad, lanceolate to narrow-elliptic. **Veins** areolate, included free veinlets few and excurrent or lacking, primary veins distinct and prominent, the rest indistinct. **Sori** round, medial, sporangia intermixed with abundant, filiform paraphyses.

In forests, climbing on tree trunks or scrambling among rocks, 850–2500 m, Apurímac, Cuzco, and Puno.

Peru; Bolivia; SE Brazil; Argentina; Paraguay; Uruguay.

Stem scales of this species are varied. At their base they are deep castaneous to nearly black, lustrous, rigid and with entire margins. But toward the center they become dull, whitish and nearly translucent, with margins long- and laxly ciliate. On older parts of the stem the delicate, whitish tips often are worn away, leaving only the firm, appressed darker portions. Thus, if a particular dried specimen contains only an older section of the stem, and another specimen only the growing tip, the two might be interpreted as representing different species.

Apurímac: Río Huacchac, Hacienda Sondor, *Bües* 1390 (US). **Cuzco:** San Miguel, Urubamba Valley, *Cook & Gilbert* 907 (US), 1753 (US). Prov. La Convención, Río Mapillo Above Pomobamba, *Davis et al.* 1259 (GH). Quilabamba, *Soukup* 161 (F). Prov. La Convención, Huadquina, *Vargas* 13909 (GH). **Puno:** Sandia, *Soukup & López* 14751 (GH), *Vargas* 11867 (GH), 14792 (GH).

11. *Microgramma ulei* (Ule) Stolze, *comb. nov.*

Polypodium ulei Ule, in Karsten & Schenk, Vegetationsbilder 2(1), t. 3. 1904. TYPE: Peru, San Martín (as Loreto), Tarapoto, *Spruce* 4127 (holotype, B!; isotype, K!; photo, F of B, GH of K).

Plants epiphytic. **Stem** 1.5–3 mm in diameter, completely covered by appressed, imbricate scales, or the tips often spreading 3–6 mm long, lanceolate, attenuate to a filiform tip, petately attached above the base, castaneous, usually with a blackish point where attached, tips orange to tawny or whitish, delicate and sometimes worn away, margins denticulate. **Leaves** chartaceous, naked, or more often with scattered, white, hairlike scales on the costa, conspicuously dimorphic, subsessile. **Petiole** 0–3 mm long. **Lamina** obtuse to subacute, the base attenuate, fertile ones 8–15 cm long, 0.2–0.7 (–0.9) cm broad, linear, sterile ones 7–11 cm long, 1–1.8 cm broad, lanceolate or narrow-elliptic. **Veins** areolate, primary ones distinct but not prominent, included free veinlets lacking, or in sterile leaves few and excurrent, indistinct. **Sori** round, inframedial to subcostal, sporangia intermixed with long, pale, filiform paraphyses.

In forests, climbing on shrubs or tree trunks, 360–900 m, San Martín.

Endemic and rare.

This was originally described and typified in an unpublished manuscript by Hieronymus and later published by Christ (*Hedwigia* 44: 363. 1905). However, Ule's publication of it in 1904, although poor and short, is nevertheless valid. We are indebted to Dr. Brigitte Zimmer at Berlin-Dahlem for bringing this to our attention (*in litt.*).

San Martín: Tarapoto, Alto Puca Yacu, *Montes* 53 (F). Alto Río Huallaga, *Ll. Williams* 6642 (F, US). Juan Guerra, *Ll. Williams* 6857 (F, US). *Spruce* 4127 and *Ule* 6600, both from Tarapoto and cited by Christ, are doubtless this species.

12. *Microgramma thurnii* (Baker) Tryon & Stolze,
comb. nov. **Figure 10a.**

Drynaria acuminata Fée, Crypt. vasc. Brésil 1: 122, t. 137, f. 3. 1869 (not Brack. 1854). TYPE: Brazil, Amazonas, Prov. Rio Negro, vicinity of Barra, *Spruce* in 1850–1851 (holotype, RB).

Polypodium thurnii Baker, Ann. Bot. (London) 5: 476. 1891. LECTOTYPE (designated here): Guyana (as British Guiana), *Ankers*, in 1829 (K!); **PARATYPE:** *Jenman*, in June "1895" (K!). *Jenman* date obviously incorrect!

Polypodium lorentense Maxon, Amer. Fern J. 23: 105. 1933. TYPE: Peru, Loreto, Balsapuerto, *Killip &*

Smith 28602 (holotype, us!; paratypes, us, numerous).

Microgramma acuminata Lellinger, Amer. Fern J. 74: 59. 1984.

Plants epiphytic. **Stem** 1.2–2.5 mm in diameter, completely covered with scales, these appressed or with spreading tips, 4–6 mm long, lanceolate, acuminate or attenuate to a filiform tip, peltately attached well above the base, orange to reddish brown, with a blackish or castaneous point of attachment, the margins entire. **Leaves** 10–21 cm long, (1.8–)2–4.5 cm broad, subsessile, essentially monomorphic. **Petiole** 0–3 mm long. **Lamina** firm-herbaceous to chartaceous, elliptic, attenuate at apex and base, glabrous. **Veins** distinct, primary ones no more prominent than the others, areolate, often with a recurrent, free veinlet in barren areoles. **Sori** superficial, round, medial.

Climbing on trees in dense forests, 100–450 m, San Martín, Loreto, Pasco, Ucayali, and Madre de Dios.

Guyana; Surinam; Venezuela; Peru; Amazonian Brazil.

This is often confused with three other species: *M. recreense* (Hieron.) Lell. (Ecuador) has a thicker stem (to 4 mm), with bicolorous, erose-ciliolate scales; the lamina of *M. lindbergii* (Mett.) Sota (Brazil) is rather amply pubescent; and *M. geminata* (Schrader) R. & A. Tryon (Brazil) has narrower leaves, impressed sori, and abundant free included veinlets spreading in various directions.

San Martín: Lamas, trail to Tioyacu and Nuevo Lamas, Knapp & Mallet 7119 (F, MO, UC). **Loreto:** Balsa-puerto, lower Río Huallaga, Killip & Smith 28392 (US), 28500 (US); Mishuyacu, near Iquitos, Killip & Smith 29890 (GH, US), Klug 553 (F, US). Prov. Maynas, Iquitos, Sagástegui & Aldave 5796 (HUT). **Pasco:** Puerto Bermúdez (as Junín), Killip & Smith 26556 (US). Prov. Oxapampa, Valle del Palcazú, Iscozacín, León 696 (F, GH, USM). **Ucayali:** Prov. Coronel Portillo, Bosque von Humboldt, Young & Grandez 1041 (F, MO). **Madre de Dios:** Tambopata Nature Reserve, Funk et al. 8155 (F). Main trail from Explorer's Inn, near confluence of Ríos Tambopata and La Torre, S. F. Smith et al. 186 (US), 981 (GH, UC).

13. *Microgramma megalophylla* (Desv.) Sota, Bol. Soc. Argent. Bot. 10: 158. 1963.

Polypodium megalophyllum Desv., Prodr. 227. 1827. LECTOTYPE (designated by Weatherby, Contr. Gray Herb. 114: 32. 1939): Brazil, Rio Negro, collector unknown (F, Herb. Desvieux).

Plants epiphytic. **Stem** commonly flattened and appressed to tree trunks, 10–35 mm broad, completely covered with appressed scales, these 4–7 mm long, lanceolate, attenuate to a filiform tip, peltately attached near the base, bicolorous, tawny to whitish with a castaneous center stripe, the margins conspicuously erose. **Leaves** 24–50 cm long, (2.5–)3.5–9 cm broad, short-petiolate, essentially monomorphic. **Petiole** 0.5–4 cm long. **Lamina** subcoriaceous, oblong or elliptic, acuminate to caudate at apex, cuneate at base, glabrous. **Veins** indistinct or, more commonly, obscure, copiously areolate, with numerous secondary areoles and with free veinlets spreading in various directions. **Sori** 4–8 mm long, round or elliptic, inframarginal, paraphyses abundant, orange to castaneous, filiform.

In lowland, often primary forests, climbing on, and usually appressed to, tree trunks, 100–200 m, Amazonas, San Martín, and Loreto.

Venezuela; Guyana; Columbia to Peru; Brazil.

The great size of the leaves and the scale-covered, broad, flattened stem easily distinguish this from all other species in the genus.

Amazonas: Mobil Oil Company trail, 3 km from La Poza, E bank of Santiago River, Berlin 3508 (MO, US). **San Martín:** Lamas, Santa Rosa de Davidcillo, Knapp & Mallet 7171 (MO). **Loreto:** Prov. Maynas, Río Ampiyacu, vicinity of Puca Urquillo, Plowman et al. 6966 (F, GH, USM). Prov. Maynas, Dist. Nanay, 3 km from Santa María de Nanay, Schunke V. 2503 (F, GH, US). Prov. Maynas, Saboya, Vásquez & Jaramillo 7418 (MO, UC). Prov. Requena, Pari, Jenaro Herrera, Vásquez & Jaramillo 1057 (F, USM).

14. *Microgramma persicariifolia* (Schrader) Presl, Tent. pterid. 214. 1836.

Polypodium persicariifolium Schrader, Gött. Gel. Anz. 1824: 867. 1824. TYPE: Brazil, Maximilian von Wied-Neuwied (BR?).

Plants epiphytic. **Stem** 1–2 mm in diameter, completely covered with appressed scales, these 4–5 mm long, lanceolate, attenuate to a filiform tip, peltately attached well above the base, orange or tawny to whitish, with a castaneous point where attached, the margins subentire. **Leaves** 10–20 cm long, (1.5–)2–3.5 cm broad, subsessile to short-petiolate, essentially monomorphic. **Petiole** 0.2–1.5 cm long. **Lamina** firm-herbaceous to chartaceous, broadly lanceolate or elliptic, acuminate at apex, attenuate at base, glabrous, but with a few, scattered, filiform scales along the costa abaxially. **Veins** rather distinct, primary ones much thicker

and more prominent than the rest, areolate, with many free, included veinlets spreading in various directions. **Sori** oblong to linear, approximately midway between and parallel to primary veins, medial.

In or at edges of forests, climbing on shrubs or small trees, 100–350 m, Loreto, Huánuco, and Madre de Dios.

Costa Rica; Panama; Trinidad; Columbia to the Guianas, south to Paraguay and Brazil.

Loreto: Mishuyacu, near Iquitos, *Klug 1594* (F, GH, US). Prov. Maynas, Iquitos, *Sagástegui & Aldave 5824* (F, GH, HUT). Río Mazán, Quebrada Salinas, *J. Schunke 359* (F, GH, UC, US, USM). **Huánuco:** Prov. Pachitea, Dist. Honoria, Bosque nacional de Iparia, *Schunke V. 1973* (F, GH, US). **Madre de Dios:** Parque Nacional del Manú, Cocha Cashu Station, Río Manú, *Foster et al. 6947* (F), *M. Foster P84-13* (UC). Prov. Tambopata, Albergue Cuzco Amazónico, *León 863* (USM).

VII. *Campyloneurum*

Contributed by Blanca León

Campyloneurum Presl, Tent. pterid. 189. 1836. LECTOTYPE: *Campyloneurum repens* (Aublet) Presl (chosen by John Sm., Hist. fil. 95. 1875). **Figure 11.**

Polypodium subg. *Cyrtophlebium* R. Br., in Benn., Pl. Jav. Rar. 1: 4. 1838. TYPE: *Cyrtophlebium repens* (Aublet) John Sm.

Cyrtophlebium (R. Br.) John Sm., J. Bot. (Hooker) 4: 58. 1841.

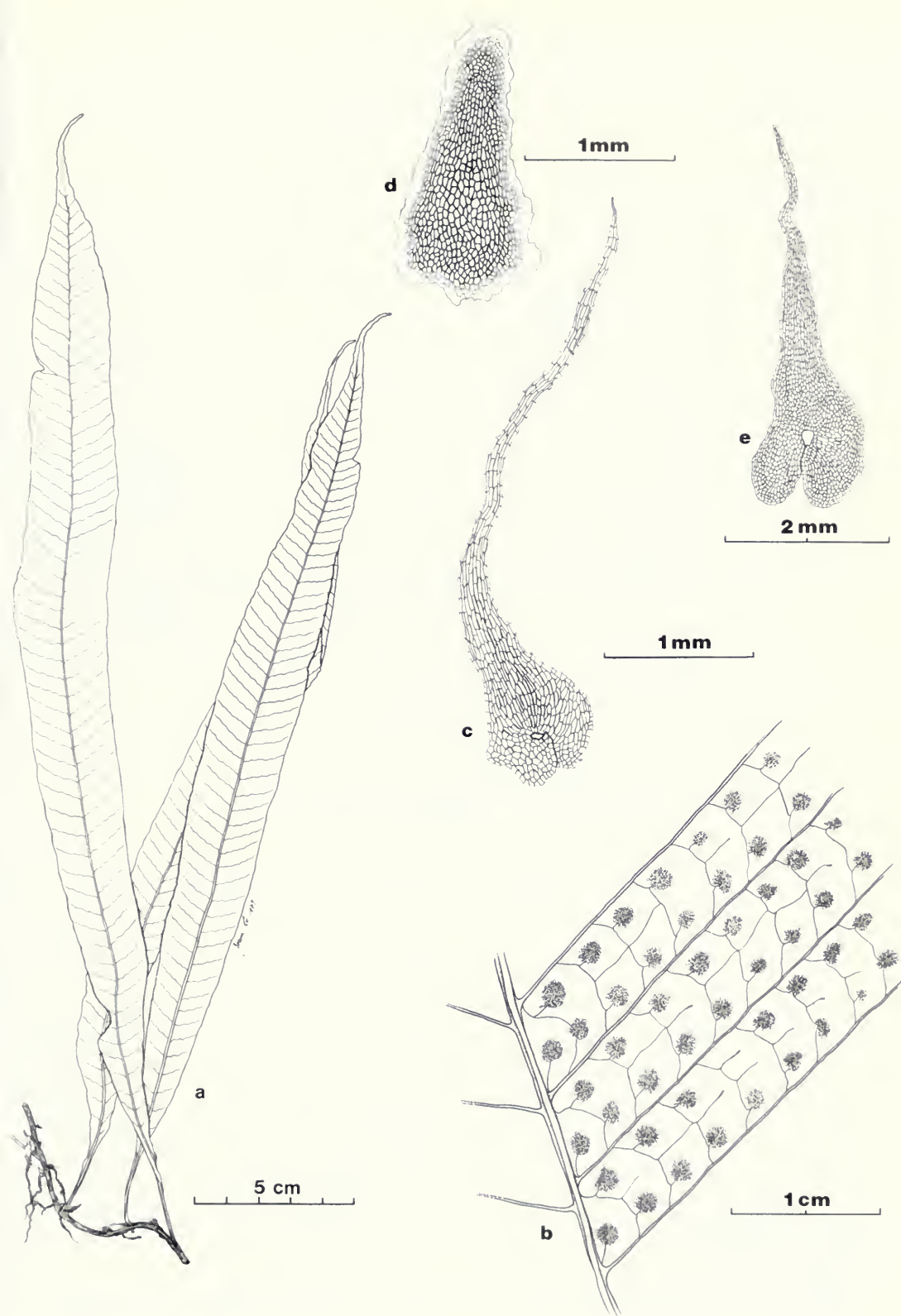
Plants epiphytic, hemiepiphytic or terrestrial. **Stem** short or long-creeping, sometimes branched, green, green-stramineous, brown-black, sometimes pruinose, indument of clathrate or nonclathrate scales, these brown, ferrugineous, dark-ochraceous, or rarely whitish. **Leaves** simple, monomorphic, ca. 20–100(–200) cm long, glabrate or rarely pubescent; phyllopodia present; petiole usually present and articulate. **Costa** usually prominent on both sides of the lamina, venation areolate, primary veins usually parallel, 45–75° divergent from the costa, secondary veins transverse to primary veins, anastomosing to form 2 or more

primary areoles, these with 1–6 included veinlets, veinlets simple or furcate, excurrent, rarely recurrent, free or anastomosed sometimes to secondary veins to form secondary areoles, apex of free veinlets with hydathodes. **Sori** without indusia, usually at the medial to apical zone of the free veinlet, rarely at the junction of 2 veinlets, in (1–)2–4(–6) series between primary veins.

Campyloneurum is a Neotropical genus containing 47 species, a few of which extend into subtropical regions of America, a majority of these occurring in forests. The generic limits are established based on the pattern of venation, which is cyrtophlebioid, rather than goniophlebioid; i.e., secondary veins that form the areoles are curved rather than straight. *Polypodium magnificum* is sometimes placed in *Campyloneurum*; however, for the purposes of this flora, the 1-pinnate species are treated under *Polypodium*.

The characters in the key to species apply to mature leaves. The prominence of veins should be examined at the middle of the leaf, and this can often be determined with the naked eye. However, examination of trichomes and stem scales requires the use of a stereomicroscope. In the past, leaf characters such as lamina width and shape were extensively used in distinguishing species, but these are only partially reliable for this purpose. Variation within several species (*Campyloneurum amphostenon*, *C. angustifolium*, *C. chlorolepis*, *C. coarctatum*) shows that leaf characters cannot be used alone. For purpose of identification, a complete specimen, including stem scales, should be available, since these are the most important characters for recognizing species, as has been shown by Lellinger (1988). However, there are still some problems within some species (*C. amphostenon*, *C. angustifolium*, and *C. densifolium*), such as the presence of different types of scales within individuals. Also, the presence of many individuals with intermediate characteristics suggests that more studies are needed to evaluate the variation of stem scale characteristics within and among populations. In certain species there are differences at the stem scale margins in cell shape, size, and disposition. These differences are expressed in this treatment as scales with margins differentiated

FIG. 11. *Campyloneurum fasciale*: a, habit. *Campyloneurum phyllitidis*: b, portion of fertile lamina. *Campyloneurum angustipaleatum*: c, stem scale. *Campyloneurum ophiocaulon*: d, stem scale. *Campyloneurum amphostenon*: e, stem scale (Adapted in part from Stolze, Ferns and Fern Allies of Guatemala, 1981.)



(such as in fig. 11d) or not differentiated (figs. 11c, 11e). Such differences have been referred to by some other authors as “scales with margins non-conform or conform.”

Reference

LELLINGER, D. B. 1988. Some new species of *Campyloneurum* and a provisional key to the genus. *Amer. Fern J.*, **78**: 14–34.

Key to Species of *Campyloneurum*

- a. Primary veins not well defined, obscure, or prominulous (rarely prominent) in different degree on either side of the lamina; primary areoles divided and stem less than 4 mm wide b
- b. Stem scales whitish in mass, not clathrate 13. *C. chlorolepis*
- b. Stem scales light or dark brown, not whitish in mass c
- c. Lamina always puberulent, with minute, inconspicuous, furcate trichomes on both sides of the lamina 1. *C. aphanophlebium*
- c. Lamina glabrous adaxially, or with indument of simple trichomes only abaxially d
- d. Leaves usually more than 5 mm apart e
- e. Stem scales not clathrate f
- f. Stem scales light brown, not shining, the cell lumina usually not occluded; stem scale bases peltate 12. *C. vulpinum*
- f. Stem scales dark brown, usually shining, the cell lumina mostly occluded; stem scale bases short-biauriculate 11. *C. asplundii*
- e. Stem scales clathrate or slightly clathrate g
- g. Stem scales usually 2–3 times as long as broad; scale bases usually more than 2.5 mm wide, with margins at the central and basal portion slightly differentiated 10. *C. densifolium*
- g. Stem scales usually 3–5 times as long as broad; scale bases usually 1.5–2(–2.5) mm wide, margins sometimes differentiated at the basal portion ... 9. *C. amphostenon*
- d. Leaves usually less than 5 mm apart h
- h. Stem scales 6–10 times longer than broad, linear from a broad base, less than 1 mm wide 16. *C. angustipaleatum*
- h. Stem scales 5 times as long as broad or less, linear-lanceolate, ovate to triangular-lanceolate, most stem scale bases usually 1 mm or more wide i
- i. Stem scales not clathrate, dark brown, often shining, the cell lumina mostly occluded 11. *C. asplundii*
- i. Stem scales clathrate or slightly clathrate, the cell lumina translucent or slightly yellow j
- j. Stem scales gray-brown in mass, the cell lumina slightly iridescent; stem not pruinose 14. *C. aglaolepis*
- j. Stem scales brown in mass, the cell lumina not iridescent; stem usually pruinose k
- k. Stem scale bases less than 1.5 mm wide; stem scales narrowly triangular-lanceolate 15. *C. angustifolium*
- k. Stem scale bases more than 1.5 mm wide; stem scales broadly triangular-lanceolate to ovate-lanceolate l
- l. Stem scales strongly clathrate, brown in mass, margins not differentiated; most scales 3–5 times as long as broad 9. *C. amphostenon*
- l. Stem scales slightly clathrate, light brown in mass, margins slightly differentiated; most of scales 2–3 times longer than broad ... 10. *C. densifolium*
- a. Primary veins well defined, prominent or prominulous to the same degree on both sides of the lamina; primary areoles divided and stem more than 4 mm wide or primary areoles not divided and stem less than 4 mm wide m
- m. Most primary areoles divided (transverse veinlets connected by a 1 or more veinlets), often with more than 2 excurrent veinlets in each primary areole; stem usually more than 5 mm wide ... n
- n. Stem scales linear, black or dark brown 20. *C. nitidissimum*

- n. Stem scales triangular-lanceolate or ovate-lanceolate, brown o
 - o. Secondary areoles essentially isodiametric; sori usually in 2 rows of sori between primary veins; stem scales triangular-lanceolate at the growing tip 17. *C. phyllitidis*
 - o. Secondary areoles irregularly shaped; sori usually in more than 2 rows between primary veins; stem scales ovate-lanceolate p
 - p. Secondary veins obscure 18. *C. brevifolium*
 - p. Secondary veins prominulous 19. *C. pascoense*
- m. Most primary areoles not divided (i.e., transverse veinlets not connected by 1 or more excurrent veinlets), usually with 2 excurrent veinlets in each; stem usually less than 4 mm wide (except *C. abruptum*) q
 - q. Petiole usually more than $\frac{1}{3}$ the length of the lamina r
 - r. Lamina subcoriaceous; stem scales usually persistent 6. *C. inflatum*
 - r. Lamina chartaceous or herbaceous; stem scales usually caducous s
 - s. Stem scales linear-lanceolate, brown or light brown, not strongly clathrate 7. *C. sphenodes*
 - s. Stem scales linear to subulate, dark brown, strongly clathrate 8. *C. coarctatum*
 - q. Petiole less than $\frac{1}{3}$ the length of the lamina t
 - t. Stem scales usually more than 5 mm long; stem diameter (4–)5–10 mm; leaves usually less than 5 mm apart 21. *C. abruptum*
 - t. Stem scales usually less than 5 mm long; stem diameter 2–4 mm; leaves usually more than 5 mm apart u
 - u. Cell lumina of the stem scales always narrow, dark yellow or almost occluded; stem scales dark brown, linear-lanceolate 5. *C. fuscusquamatum*
 - u. Cell lumina of the stem scales transparent or yellowish, not occluded; stem scales brown, linear-lanceolate or ovate-lanceolate v
 - v. Apex of stem scales obtuse, stem diameter usually more than 3 mm 3. *C. ophiocaulon*
 - v. Apex of stem scales always acuminate, stem diameter usually less than 3 mm ... w
 - w. Stem scales with differentiated margins 2. *C. repens*
 - w. Stem scales without differentiated margins x
 - x. Lamina narrowly lanceolate, usually less than 5 cm wide, the base long-decurrent; stem scales narrowly lanceolate 4. *C. fasciale*
 - x. Lamina broadly lanceolate, usually more than 5 cm wide, the base broad-cuneate or short-decurrent; stem scales linear 8. *C. coarctatum*

1. **Campyloneurum aphanophlebium** (Kunze)
Moore, Index fil. 223. 1861.

Polypodium aphanophlebium Kunze, Bot. Zeit. (Berlin) 288. 1845. TYPE: Venezuela, Caracas, *Moritz* 17 (holotype, B!).

Polypodium occultum Christ, Bull. Herb. Boissier II, 5: 7. 1905. TYPE: Costa Rica, Prov. Cartago, Río de las Vueltas, *Tonduz* 12752 (holotype, P!; isotypes B!, BM!).

Polypodium trichiatum Rosenst., Repert. Spec. Nov. Regni Veg. 7: 148. 1909. TYPE: Ecuador, Rimbamba, Cordillera Occidental, *Rimbach* 87 (holotype, s!; isotypes, us!; photo, BM of s).

Campyloneurum trichiatum (Rosenst.) Ching, Sunyatsenia 5: 263. 1940.

Campyloneurum occultum (Christ) Gómez, Brenesia 8: 46. 1976.

Epiphytic, rarely terrestrial. **Stem** creeping, 1–3(–4) mm wide, not pruinose, with scales brown,

linear-lanceolate. **Leaves** (10–)20–40(–50) cm long, 2–4(–6) mm apart, petiole (0.3–)0.7–3(–6) cm long, stramineous or brown-stramineous, indument of minute furcate trichomes. **Lamina** oblanceolate, rarely narrowly lanceolate, chartaceous, (1.2–)2–4(–4.7) cm wide, with attenuate base, with plane or slightly revolute margins, with acuminate or subcaudate apex, puberulent, indument of minute and very unequally furcate trichomes on both sides of the lamina, relatively dense abaxially. **Costa** prominent, plane or slightly canaliculate adaxially, convex or anuglate abaxially; primary veins slightly prominulous or obscure, more or less concolorous with the adjacent tissue, slightly flexuous, (3–)4–7(–9) mm apart, diverging 50–60(–65)° from the costa, areoles between costa and margin 3–6, with 2(–3) excurrent veinlets in each areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses dendritic.

On tree trunks, sometimes in rock crevices, in shady places of lowland forests, 100–1000 m, Amazonas, San Martín, Loreto, Huánuco, Pasco, and Junín.

Belize; Nicaragua to Venezuela, south to Bolivia and Brazil.

Dry specimens of *Campyloneurum aphanophlebium* sometimes are dull green or brownish on both sides of the lamina. Because of the venation pattern, it is here allied with *C. repens* and related species.

Amazonas: Prov. Bagua, ca. 1 km NE of Quebrada Chinganza, 10 km NE of Mayo, *Knapp & Alcorn 7733* (NY). Prov. Bagua, Montenegro-Chiriaco, *Sagástegui 5924* (HUT). **San Martín:** Prov. Mariscal Cáceres, Campanilla, Cajón Pericote, *J. Schunke V. 4288* (UC, USM). Río Marañón, *Spruce 3912* (K). **Loreto:** Prov. Alto Amazonas, Balsapuerto, lower Río Huallaga, *Killip & Smith 28642* (NY, US). Prov. Loreto, San José de Parinari, *Vásquez et al. 2274* (NY). **Huánuco:** Sinchono, Fundo Chela, *Aguilar 946* (USM). Prov. Pachitea, Puerto Inca, Agua Dulce, al este de Puerto Inca, *J. Schunke V. 2818* (GH, US). Tingo María, *Tryon & Tryon 5335* (GH, US, USM). Cachicoto, *Woytkowski 7868* (UC). **Pasco** (as Junín): Prov. Oxapampa, Puerto Bermúdez, *Killip & Smith 26647* (US). **Junín:** Prov. Chanchamayo, La Merced, *Killip & Smith 23781* (GH, NY, US). Río Paucartambo, near Perené bridge, *Killip & Smith 25268* (S).

2. *Campyloneurum repens* (Aublet) Presl, Tent. pterid. 190. 1836.

Polypodium repens Aublet, Hist. pl. Guiane 2: 962. 1775. TYPE: Plumier, Taité foug. Amér., t. 134, 1705.

Polypodium lapathifolium Poirlet, in Lam., Encycl. 5: 514. 1804. TYPE: America meridional, *Herb. Jussieu 1071-E* (holotype, P; photos, BM, S).

Polypodium caespitosum Link, Hort. berol. 2: 91. 1833. TYPE: Cultivated, ex Hort. Loddiges (holotype, B!).

Campyloneurum caespitosum (Link) Link, Fil. spec. 125. 1841.

Cyrtophlebium repens (Aublet) John Sm., J. Bot. (Hooker) 4: 58. 1841.

Campyloneurum lapathifolium (Poirlet) Ching, Sunyatsenia 5: 263. 1940.

Epiphytic or hemiepiphytic. **Stem** long-creeping, 1–3(–4) mm wide, not pruinose, stem scales brown or light brown, lanceolate, clathrate, with center and margins differentiated in cell wall color and cell structure. **Leaves** 20–60 cm long, (5–)10–15 mm apart, petiole 0.5–7(–13) cm long, stramineous. **Lamina** oblong-lanceolate or obovate-lanceolate, sometimes narrowly lanceolate, herbaceous-chartaceous, (2.5–)3–8 cm wide, with attenuate, sometimes narrowly cuneate, base, with slight sinuate, cartilaginous, plane or very slightly

revolute margins, with acuminate or caudate apex, indument scarce, of simple and sometimes furcate trichomes, scarce abaxially. **Costa** prominent, slightly sulcate adaxially; primary veins prominent or prominulous on both sides of the lamina, slightly flexuous or straight, often lighter in color than the adjacent tissue, (3–)5–7 mm apart, diverging (65–)70–75° from the costa, areoles between costa and margin (4–)6–12, with 2(–4) free excurrent veinlets in each areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses not seen.

Usually in shady and humid places of lowland and montane forests, 100–2000 m, Amazonas, San Martín, Loreto, Huánuco, Pasco, Ayacucho, Cuzco, and Madre de Dios.

Mexico; Central America; Lesser Antilles; Guianas; Venezuela; Columbia to Bolivia and central Brazil.

Amazonas: Prov. Bagua, Cordillera Colán, SE of La Peca, *Barbour 4188* (F). **San Martín:** Prov. Mariscal Cáceres, Tocache Nuevo, *J. Schunke V. 6952* (F, MO). Parque Nacional Río Abiseo, hill pass Las Palmas, *Young 4324* (USM). **Loreto:** Prov. Maynas, Gamitanacocha, Río Mazan, *J. Schunke 205* (F, S, UC, US). **Huánuco:** Prov. Leoncio Prado, Dist. Hermilio Valdizán, from Puma-huasi to La Cumbre, *Plowman & Schunke 7414* (F). **Pasco:** Prov. Oxapampa, Gran Pajonal, vicinity of Chequitavo, *D. Smith 5265* (UC). **Ayacucho:** Prov. La Mar, E massif of Cordillera Central, between Tambo San Miguel, Ayna and Hacienda Luisiana, *Dudley 11908* (GH). **Cuzco:** Prov. Paucartambo, Hacienda Villa Carmen, *Vargas 14697* (GH). **Madre de Dios:** Prov. Tambopata, Tambopata Nature Reserve, SSW of Puerto Maldonado, *Barbour 4853* (F, MO).

3. *Campyloneurum ophiocaulon* (Klotzsch) Fée (Mém. foug. 5) Gen. fil. 258. 1852. **Figure 11d.**

Polypodium ophiocaulon Klotzsch, Linnaea 20: 401. 1847. TYPE: Peru, Junín, *Dombey 41* (holotype, B; photo, BM).

Epiphytic. **Stem** long-creeping, brown or dark stramineous, (2–)2.5–4 mm wide, scales brown, clathrate, ovate-lanceolate, apex obtuse, margins differentiated. **Leaves** 30–50 cm long, 1–2 cm apart, petiole dark stramineous, 2.5–4.5 cm long. **Lamina** oblanceolate or broadly lanceolate, chartaceous, 3.5–7 cm wide, with attenuate base, with sinuate, cartilaginous margins, with acuminate, apex, indument of sparse, simple trichomes, spreading abaxially. **Costa** prominent; primary veins prominulous, lighter in color than the ad-

jacent tissue, 6–7 mm apart, diverging 65–70(–80)° from the costa, with 8–11 areoles between costa and margin, with 2(–3) free excurrent veinlets in each areole. **Sori** medial on the excurrent veinlets, paraphyses inconspicuous or lacking.

In shady places, rarely in open light gaps, from lowland forests to montane forests, (1500–)2000–2500 m, Cajamarca, Amazonas, San Martín, Ucayali, Huánuco, Pasco, Junín, and Cuzco.

Columbia to Bolivia.

Cajamarca: Prov. Cutervo, San Andres de Cutervo, arriba de Saucedal, pasando por Chorro Blanco, *Diaz & Osorio* 2963 (MO). **Amazonas:** Prov. Bagua, E of La Peca, *Barbour* 2812 (AAU, F, UC). **San Martín:** Prov. Rioja, Pedro Ruiz–Moyobamba road, km 390 Venceremos, *D. Smith* 4498 (F, NY, UC). **Ucayali:** La Divisoria, ca. 25 km NE of Tingo María, *Moran & Fernández* 3693 (MO, UC, USM). **Huánuco:** Prov. Huánuco, Pampayacu, *Kanehira* 119 (GH, US). **Prov. Leoncio Prado**, road between Tingo María and Pucallpa, *Sullivan & Young* 1147 (F). **Pasco:** Oxapampa, Ulcumanu SW of Oxapampa, road to María Teresa and Llaupí, *Foster et al.* 7682 (USM). **Prov. Oxapampa**, rodal del Sr. Müller, cerca a Oxapampa, *León* 495 (F, USM). **Junín:** Villa Amoretti, *Kunkel* 524 (GH). In the area of Pichita Caluga, *Walden* 26 (BM). **Cuzco:** Prov. La Convención, entre Quillabamba y Abra de Málaga, *Ellenberg* 4739 (LPB). **Prov. Paucartambo**, km 136 carretera Acjanaco–Pilcopata, abajo de Buenos Aires, *León* 2183 (F, USM). **Prov. Urubamba**, Machu Picchu Sanctuary, Puncuyo, *Peyton & Tilney-Peyton* 1365 (GH). **Prov. La Convención**, Amaibamba, *Vargas* 9804 (UC).

4. *Campyloneurum fasciale* (Willd.) Presl, Tent. pterid. 190. 1836. **Figure 11a.**

Polypodium fasciale Willd., Sp. pl. 5. 156. 1810. TYPE: Venezuela, Caripe, *Humboldt* 426 (holotype, B!, Herb. Willd. 19632; photo, BM, GH).

Polypodium serpentinum Christ, Bull. Herb. Boissier II, 6: 51. 1906. TYPE: Costa Rica, Navarro, *Wercklé* (holotype, P!; photo, BM).

Campyloneurum serpentinum (Christ) Ching, Sunyatsenia 5: 263. 1940.

Epiphytic. **Stem** long-creeping, 1–3 mm wide, not pruinose, dark green or green, the scales brown or dark brown, narrowly lanceolate. **Leaves** erect or subpendent, 20–40(–50) cm long, 5–10 mm apart, petiole 1–2 cm long, stramineous or brownish. **Lamina** lanceolate or narrowly lanceolate, rarely linear-lanceolate, herbaceous-chartaceous, (0.8–)2.5–5 cm wide, with attenuate, rarely narrowly cuneate base, with slightly revolute or plane, slightly sinuate, cartilaginous margins, with acuminate apex, indument of simple trichomes, these scarce abaxially. **Costa** prominent, with caducous

scales; primary veins prominulous, 3.5–5 mm apart, diverging 60–70(–75)° from the costa, with (4–)5–8 areoles between costa and margin. **Sori** medial or subterminal, paraphyses inconspicuous or lacking.

In mountain forests, 300–2400 m, Amazonas, San Martín, Loreto, Pasco, Junín, and Madre de Dios.

Southern Mexico; Central America; Venezuela and French Guiana; Columbia to Bolivia.

Campyloneurum fasciale can be distinguished from the related species *C. fuscusquamatum* and *C. repens* by the stem scale characters, as noted in the key. *Campyloneurum fasciale* differs from *C. coarctatum* on leaf shape and stem scale features; in the former, the lamina base is attenuate, rarely narrowly cuneate, with slightly rigid, adpressed, stem scales, while in the latter the lamina base is usually acuminate or narrowly cuneate with flexuous stem scales.

Amazonas: Prov. Bongará, SW of Pomacocha, *Wurdack* 844 (F, NY, UC, US, USM). Sipabamba, Shillac, *Young & Eisenberg* 352a (MO, NY, UC). **Prov. Bagua**, 12 km E of La Peca, *Barbour* 2487 (MO, UC), *Barbour* 2495 (F, UC), *Gentry et al.* 22930 (F, MO, UC). **San Martín:** Campana, Tarapoto, *Spruce* 4647 (BM). **Loreto:** Santa Rosa, lower Río Huallaga, below Yurimaguas, *Killip & Smith* 28927 (US). **Pasco:** Prov. Oxapampa, Paujil, near Puerto Bermúdez, *León* 287 (GH, USM). **Junín:** Pichis trail, Yapas, *Killip & Smith* 25606 (F, US). **Madre de Dios:** Prov. Manú, Manú National Park, Cocha Cashu, *Nuñez* 6070 (NY).

5. *Campyloneurum fuscusquamatum* Lell., Amer.

Fern J. 78: 21. 1988. TYPE: Peru, Huánuco, Tingo María, *Stork & Horton* 9452 (holotype, US; isotypes, F!, GH!, UC!; photo, USM of US).

Epiphytic. **Stem** long-creeping, 2–3 mm wide, green or green-stramineous to black, not pruinose, with scales dark brown, linear-lanceolate, the cell lumina occluded. **Leaves** erect or partially pendent, 20–40 cm long, 4–8 mm apart, petiole 0.5–5 cm long, stramineous, sometimes darker abaxially. **Lamina** narrowly oblanceolate or oblong, herbaceous-chartaceous, 2–5(–8) cm wide, with attenuate or narrowly cuneate base, with slightly revolute or plane, cartilaginous margins, with acute or acuminate apex, indument of scarce, simple, inconspicuous trichomes. **Costa** prominent, sometimes with scales similar to those of the stem; primary veins prominulous, slightly flexuous, diverging (60–)70–75(–80)° from the costa, with 6–10 areoles between costa and margin, with 2(–3)

excurrent veinlets in each noncostal areole. **Sori** medial or subterminal on the free excurrent veinlet, paraphyses inconspicuous or lacking.

In humid and shady places, humid lowland forests or premontane forests, 100–1250 m, San Martín and Loreto, south to Ayacucho and Madre de Dios.

Columbia to Bolivia.

This species is closely related to *C. fasciale* and *C. repens*.

San Martín: Prov. Mariscal Cáceres, Campanilla, sudoeste del Caserío de Sión, *J. Schunke V. 3556* (F, USM). Prov. San Martín, 4 mi E of Tarapoto, *Woytkowski 35235* (MO, S, UC). **Loreto:** Prov. Maynas, Quebrada Tamshiyacu, E of Tamshiyacu, *Gentry et al. 25837* (F, MO). **Huánuco:** Tingo María, *Ferreira 10276* (GH, USM). Prov. Pachitae, Codo de Pozuzo, *Foster 9399* (F). Prov. Huánuco, Dist. Churubamba, Hacienda Mercedes, Balsa-playa, *Mexia 8176* (BM, F, GH, MO, S, UC, USM). **Pasco:** Prov. Oxapampa, Pozuzo, *Macbride 4585* (F, US). **Junín:** Chanchamayo valley, *Soukup 1103* (F). **Ayacucho:** Río Apurímac, near Kimpitiriki, *Killip & Smith 22861* (F, US). Prov. La Mar, 2 km NW of Santa Rosa, *Wasshausen & Encarnación 621* (MO, USM). **Cuzco:** Prov. Convención, NE from Hacienda Luisiana, *Dudley 11501* (GH, US). **Madre de Dios:** Prov. Manú, Parque Nacional Manú, Cocha Cashu Biological Station, *M. Foster P-84-17* (MO). Prov. Tambopata, alrededores de "Cuzco Amazónico," *León 836* (USM).

6. *Campyloneurum inflatum* Lell., Amer. Fern. J. 78: 22. 1988. TYPE: Columbia, Cauca, W slope of Cerro Munchique, *Pérez Arbelaez & Cuatrecasas 6244* (holotype, US!; isotypes, COL, F!; photo, USM of US).

Epiphytic. **Stem** long creeping, 2 mm wide, not pruinose, green, stramineous or black, the scales bright brown, lanceolate. **Leaves** 30–55 cm long, 3–4 cm apart, petiole 9–21 cm long, stramineous to dark stramineous. **Lamina** elliptic, cartilaginous, subcoriaceous, 6–10.5 cm wide, with acute base, with strongly cartilaginous, slightly revolute margins, with caudate apex, indument lacking. **Costa** prominent, slightly sulcate, indument of caducous scales; primary veins slightly prominulous adaxially, prominent abaxially, slightly flexuous, lighter in color than the adjacent tissue, 7–8 mm apart, diverging 65–70° from the costa, with 6–7 areoles between costa and margin, with 2(–4) free excurrent veinlets per areole, obsolete, sometimes secondary areoles close to the margin. **Sori** subterminal on the excurrent veinlets, paraphyses not seen.

In Peru only known from Amazonas, 2200–2400 m.

Columbia; Peru.

Amazonas: Prov. Bongará, WSW of Pomacocha, *Wurdack 868* (US).

7. *Campyloneurum sphenodes* (Klotzsch) Fée, (Mém. foug. 5) Gen. fil. 258. 1852.

Polypodium sphenodes Klotzsch, Linnaea 20: 242. 1847. TYPE: Venezuela, Mérida, *Moritz 304* (holotype, B!; isotypes, BM!, K!).

Epiphytic, hemiepiphytic, rarely terrestrial. **Stem** long-creeping, (1–)2–3(–4) mm wide, not pruinose, with scales brownish, light brown, lanceolate or narrowly lanceolate, adpressed, slightly clathrate. **Leaves** erect, 25–50 cm long, 0.7–2.5 cm apart; petiole 5–15 cm long, stramineous or dark-stramineous. **Lamina** narrowly elliptic or lanceolate, chartaceous, (2–)4–6 cm wide, with narrowly cuculate, short attenuate base, with slightly undulate, cartilaginous margins, with acuminate apex, indument inconspicuous or lacking. **Costa** prominent, primary veins priminulous on both sides of the lamina, straight, 5–7 mm apart, (60–)65–70° divergent from the costa, with 6–12 areoles between costa and margin, with 2(–3) free excurrent veinlets in each areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses inconspicuous or lacking.

Uncommon in Peru, on tree trunks, in montane or lowland forests, 200–2500 m, Piura, Cajamarca, Amazonas, and Junín.

Costa Rica; Panama; Venezuela and Columbia, south to Bolivia.

Piura: Prov. Huancabamba, Canchaque, cerca a Chorro Blanco, *Ramirez & Lamas* (F, USM). **Cajamarca:** Prov. Santa Cruz, Dist. Catache, ca. 5 km above Monte Seco, *Dillon et al. 4901* (F). **Amazonas:** Prov. Bagua, Cordillera Colán, SE of La Peca, *Barbour 3893* (MO). **Junín:** Prov. Chanchamayo, E of Quimiri bridge, *Killip & Smith 23896* (F, GH, US).

8. *Campyloneurum coarctatum* (Kunze) Fée, (Mém. foug. 5) Gen. fil. 258. 1852.

Polypodium coarctatum Kunze, Linnaea 9: 39. 1834. TYPE: Peru, Huánuco, Cucheros, *Poeppig* in July 1829 (holotype, LZ, destroyed; isotypes, P!, W!; photo, BM of W).

Epiphytic, rarely terrestrial. **Stem** long-creeping,

(1.5–)2.5–3.5 mm wide, green, turning black with age, rarely stramineous, the scales narrowly lanceolate to linear-lanceolate. **Leaves** erect, 45–85 cm long, 5–9 mm apart, petiole 10–16 cm long, stramineous to dark stramineous. **Lamina** usually broadly elliptic to ovate-elliptic, rarely narrow-elliptic, chartaceous, (6–)8–13 cm wide, with narrowly cuneate or acuminate, rarely short-attenuate base, with slightly sinuate, cartilaginous margins, with attenuate apex, indument of inconspicuous, simple trichomes, spreading abaxially. **Costa** prominent; primary veins priminulous on both sides of the lamina, diverging 60–70° from the costa, with 10–19 undivided areoles between costa and margin, with usually 2 free veinlets in each areole. **Sori** subterminal or medial, on the excurrent veinlets, paraphyses inconspicuous or lacking.

Usually in humid and shady places of humid forests, 100–1000(–2000) m, Cajamarca, San Martín, Loreto, Ucayali, Huánuco, Junín, and Ayacucho.

Costa Rica; Panama; French Guiana; Colombia; Bolivia; central Brazil.

Campyloneurum coarctatum can be recognized by having nearly linear, strongly clathrate stem scales. It is closely related to *C. sphenodes*.

Cajamarca: Prov. Santa Cruz, ENE Monteseo, *Santisteban & Guevara 31* (F, HUT). **San Martín:** Prov. San Martín, Tarapoto, *Spruce 4646* (BM, NY, w). **Loreto:** Prov. Loreto, Río Marañón, arriba del caserío Suramuro, *Díaz & Ruiz 875* (MO). Santa Rosa, lower Río Huallaga, below Yurimaguas, *Killip & Smith 28854* (F, NY), 27668 (F, NY). **Ucayali:** Prov. Coronel Portillo, Bosque von Humboldt, *Young & Salazar 1015* (F, MO). **Huánuco:** Huánuco, gorge of Río Chinchao, *Tryon & Tryon 5302* (BM, F, GH, NY, UC, US). **Junín:** Tarma, Agua Dulce, *Woytkowski 37025* (MO, UC). **Ayacucho:** Prov. La Mar, Aina

(Ayna), between Huanta and Río Apurímac, *Killip & Smith 22720* (us).

9. *Campyloneurum amphostenon* (Klotzsch) Fée (Mém. foug. 5) Gen. fil. 258. 1852.

Terrestrial or epiphytic. **Stem** long-creeping, (2–) 3–5 mm wide, usually pruinose, the scales brown, lanceolate. **Leaves** erect, 15–60(–70) cm long, (2–) 5–10 mm apart, petiole 4–30 cm long, stramineous or brown-stramineous. **Lamina** linear-lanceolate or lanceolate, chartaceous or subcoriaceous, (0.7–) 2–5 cm wide, with attenuate base, with slightly revolute or plane, cartilaginous margins, with acuminate apex, indument of simple trichomes, scarce abaxially. **Costa** prominent, indument of caducous scales; primary veins obscure or prominulous adaxially, slightly prominulous abaxially, often concolorous with the adjacent tissue, straight or slightly flexuous, 5–7 mm apart, diverging 45–60° from the costa, with 2–4(–5) areoles between costa and margin, with 1–2 free excurrent veinlets in each noncostal areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses inconspicuous or lacking.

I recognize *Campyloneurum amphostenon* as a complex of different populations, especially in the Andean region, probably reflecting incomplete speciation. Leaf and stem scale characteristics are extremely variable, as reflected in the description, sometimes at the individual level. Therefore, more studies, especially using cytogenetic techniques, are needed to evaluate this complex. Based on the currently available information, I recognize two varieties in this species.

Key to Varieties

- a. Most of stem scales with elongate cells parallel to the main axis 9a. var. **amphostenon**
a. Most of stem scales with cells irregularly ordered 9b. var. **irregulare**

Campyloneurum amphostenon is closely related to *C. asplundii* and *C. densifolium*. Besides the characters provided in the key, *C. amphostenon* can be distinguished by the stem scales having an acuminate apex. *Campyloneurum densifolium* has the apex acute or broad and short-acuminate. *Campyloneurum amphostenon* differs from *C. asplundii* by having clathrate stem scales, with bases

usually more than 1.5 mm wide and cell lumina translucent or yellowish, while the latter has non-clathrate stem scales, with bases usually less than 1.5 mm wide and cell lumina brownish. However there are some intermediate specimens such as *Núñez 8422* (F, NY), *Vargas 11864* (GH), and *Young & León 4519* (USM), with scales strongly clathrate but shaped like those of *C. asplundii*.

9a. *Campyloneurum amphostenon* var. *amphostenon*. Figure 11e.

Polypodium amphostenon Klotzsch, Linnaea 20: 399. 1847. TYPE: Venezuela, Mérida, Moritz 120b (holotype, B!; isotypes, BM!, K).

Campyloneurum angustifolium var. *amphostenon* (Klotzsch) Farw., Amer. Midl. Naturalist 12: 296. 1931.

This variety is recognized by the character provided in the key.

Leaves, sometimes in rather dense tufts, on tree trunks in remnant forested areas, or in shady rock crevices, in montane areas, (1500–)2000–4000 m, Piura, Cajamarca, Amazonas, La Libertad, San Martín, Ancash, Huánuco, Lima, Pasco, Junín, Huancavelica, Ayacucho, Cuzco, and Puno.

Mexico; Central America; West Indies; Venezuela; Columbia to Bolivia.

Piura: Prov. Huancabamba, Cuello del Indio, López et al. 8894 (GH, MO, UC). **Cajamarca:** Prov. Santa Cruz, Dist. Catache, upper Río Zaña valley, ca. 5 km above Monte Seco, Dillon et al. 4896 (F, UC). Prov. Cajamarca, arriba de La Encañada, ruta a Celendín, Sagástegui et al. 9404 (F, NY). **Amazonas:** Prov. Chachapoyas, Caño Santa Lucía, E of Chachapoyas, Wurdack 736 (US, USM). **La Libertad:** Prov. Sánchez Carrión, Huamachuco–Cajabamba road, D. Smith & Vásquez 3378 (F, UC). **San Martín:** Prov. Mariscal Cáceres, Parque Nacional Río Abiseo, Chochos, Young & León 4562 (USM, HUT). **Ancash:** Prov. Santa, Jalca de Ulu-Cruz (Jimbe), Mostacero et al. 1869 (F, NY). Prov. Huari, Parque Nacional Huascarán, Quebrada Carhuaz-Cancha, D. Smith et al. 12243 (F). **Huánuco:** Mito, Macbride & Featherstone 1919 (US), Huacachi, estación near Muña, Macbride 4127 (F). **Lima:** Prov. Huarochirí, Infernillo, entre Lima y La Oroya, Ferreyra 6236 (BM, USM). Viso, Goodspeed et al. 11547 (GH, UC, US). **Pasco:** Prov. Pasco, entre Huariaca y Cerro de Pasco, Ferreyra 9502 (GH). Prov. Oxapampa, trail to summit of Cordillera Yanachaga, via Río San Daniel, D. Smith et al. 7856a (USM). **Junín:** Prov. Tarma, Incatacuna, entre Tarmatambo y Acolla, Constance & Tovar 2348 (UC). Prov. Satipo, Dist. Pampa Hermosa, road Concepción–Satipo, Saunders 1068 (GH). **Huancavelica:** Prov. Tayacaja, Huaribamba, 1 km before Huari, Saunders 1147 (GH). Chuspi, cerca a Tocas, Tovar 2039 (GH, USM). **Ayacucho:** Prov. La Mar, E massif of the Cordillera Central, between Tambo San Miguel, Ayna and the Hacienda Luisiana, Dudley 12029 (GH). Road from Tambo to Ayna, Plowman & Davis 4676 (GH). **Cuzco:** Prov. Urubamba, Quebrada above Pojpoj, Davis et al. 1477 (F, NY, USM). Prov. Paucartambo, Parque Nacional Manú, León 2290 (F, USM). Prov. Urubamba, Machu Picchu Sanctuary, in Urcoscancha, above the village of Palcay, Peyton & Tilney-Peyton 761 (GH). **Puno:** Granja Salcedo, near Puno, Soukup 10 (F).

9b. *Campyloneurum amphostenon* var. *irregulare* (Lell.) B. León, comb. nov.

Campyloneurum irregulare Lellinger, Amer. Fern J. 78: 24. 1988. TYPE: Ecuador, Pichincha, Holdridge 1580 (holotype, us!).

This variety grows between 2700 and 4000 m, from Cajamarca to Puno. It seems to occur commonly in open, rocky areas.

Venezuela to Bolivia.

Cajamarca: Prov. Hualgayoc, Cajamarca–Bambamarca road, pass above Hualgayoc, D. Smith & R. Vásquez 3519 (F, MO, UC). **Amazonas:** Prov. Chachapoyas, upper slopes and summit of Cerro Campanario, Wurdack 1574 (GH, NY, US). **La Libertad:** Prov. Otuzco, Llaguén, Shilte, Lopez 1560 (GH). **San Martín:** Prov. Mariscal Cáceres, Parque Nacional Río Abiseo, Puerta del Monte, P5 patch of forest, Young 1986 (F, USM). **Huánuco:** Mito, Bryan 204 (F). **Pasco** (as Junín): Prov. Pasco, between Cerro de Pasco and La Quinua, Asplund 11869 (US). **Junín:** Prov. Huancayo, Huancayo, Soukup 3646 (BM, F). **Cuzco:** Prov. Paucartambo, Tres Cruces, upper edge of Parque Nacional Manu, Gentry et al. 23450 (MO, US). Prov. Cuzco, near Saxaihuaman, Tryon & Tryon 5345 (BM, F, GH, US). **Puno:** Baja Isla, Lake Titicaca, Mexia 7787 (BM, F, GB, GH, MO, S, UC). Prov. Huancané, Moho, Shepard 54 (GH).

10. *Campyloneurum densifolium* (Hieron.) Lell., Amer. Fern J. 78: 19. 1988.

Polypodium angustifolium f. *densifolium* Hieron., Bot. Jahrb. Syst. 34: 532. 1904. LECTOTYPE (designated by Lellinger, Amer. Fern J. 78: 1919. 1988): Ecuador, Azuay, near Las Yervas Buenas, Lehmann 5723 (US; isoelectotypes, B!, F!).

Epiphytic or terrestrial. **Stem** long-creeping, 3–6 mm wide, usually pruinose, the scales ovate-lanceolate, light brown or yellow-brown. **Leaves** erect, 30–70 cm long, 3–10 mm apart, petiole 10–30 cm long, brown-stramineous. **Lamina** linear-lanceolate or lanceolate, chartaceous or subcoriaceous, (1–)2–4(–5) cm wide, with attenuate or narrowly cuneate base, with slightly or strongly revolute margins, with acuminate apex, indument inconspicuous or lacking. **Costa** prominent, indument of caducous scales; primary veins obscure or prominulous and more or less lighter in color than the adjacent tissue adaxially, 5–7 mm apart, diverging (45–)50–65(–70)° from the costa, with 2–4 areoles between costa and margin. **Sori** medial or subterminal on the excurrent veinlet, paraphyses inconspicuous or lacking.

In open exposed areas or in open and humid places of montane forests, (2000–)2500–3800 (–4200) m, Piura, Cajamarca, La Libertad, San Martín, and Ancash.

Southern Mexico; Central America; Greater Antilles; Colombia and Venezuela to Bolivia.

I recognize *Campyloneurum densifolium* as distinct from *C. amphotenon* based on the differences in dimensions of the stem scales, which in the former are mostly ovate-lanceolate with acute or short-acuminate apex. Also, *C. densifolium* has usually adpressed, rather persistent stem scales, while the latter has slightly spreading, semipersistent scales. I have seen both species growing in the same area and same type of habitat. In rocky places *C. densifolium* seems to predominate, but it is scarcer in closed mountain forests. *Campyloneurum lorentzii* (Hieron.) Ching, which occurs in Bolivia and Argentina, differs by having broader stem scales with an obtuse apex.

Piura: Prov. Huancabamba, above Canchaque, *Hutchison 1646* (UC). **Cajamarca:** Prov. Contumazá, Pampa de la Sal, *Sagástegui et al. 10747* (F). **La Libertad:** Prov. Santiago de Chuco, 26 km from Santiago, *D. Smith 2329* (USM). **San Martín:** Prov. Mariscal Cáceres, Parque Nacional Río Abiseo, Chochos valley, forest patch C9 above timberline, *Young 2586* (F, USM). **Ancash:** Prov. Bolognesi, Tinya, valle del Río Fortaleza, *Cerrate 2585* (GH, USM). Prov. Yungay, Parque Nacional Huascarán, Quebrada Llanganuco, *Pérez 100* (USM).

11. *Campyloneurum asplundii* (C. Chr.) Ching, *Sunyatsenia* 5: 263. 1940.

Polypodium asplundii C. Chr., *Ark. Bot.* 20A(7): 24. 1926. TYPE: Bolivia, Prov. Sur Yungas, La Sirena, ca. 2300 m. *Asplund 282* (holotype, s!; isotype, BM).

Epiphytic or terrestrial. **Stem** creeping, sometimes branched, (2–)3–4(–4.5) mm wide, sometimes pruinose, black, with spreading, usually caducous, persistent only at growing tips, linear, nonclathrate, dark brown, shining scales, with cell laminae occluded, scale base short-biauriculate. **Leaves** erect, 35–60 cm long, 2–10 mm apart, petiole 0.8–3.8(–20) cm long, stramineous or castaneous. **Lamina** linear to narrowly lanceolate, chartaceous, (0.6–)1.5–3.5(–5.8) cm wide, with decurrent base, with cartilaginous slightly revolute margins, with acuminate apex, indument abaxially of simple trichomes, these sometimes with dark apical cell. **Costa** prominent, indument of often persistent scales; primary veins obscure or slightly prominulous to different degrees on either side of the lamina, sometimes to the same degree, slightly flexuous, 4–5 mm apart, diverging 50–60° from the costa, with 2–4 areoles between costa and margin, with 1(–2) free excurrent veinlet in each areole.

Sori subterminal on the excurrent veinlets, paraphyses inconspicuous or lacking.

Usually epiphytic, or when terrestrial growing in abundant organic matter, in montane forests between (1500–)1800 and 2700(–3200) m, Amazonas, San Martín, Huánuco, Lima, Pasco, Junín, Ayacucho, Cuzco, and Puno.

Ecuador; Peru; Bolivia.

Amazonas: Prov. Chachapoyas, along Río Ventilla, 1–2 km W of Molinopampa, *Wurdack 1490* (US, USM). **San Martín:** Prov. Mariscal Cáceres, Parque Nacional Río Abiseo, trail between La Playa camp and Papayas camp, *Young & León 4995* (F, USM). **Huánuco:** Carpish, *Coronado 62* (GH, UC, US). Yanano, *Macbride 3818* (F, GH, US). Muña, *Woytkowski 5181* (GH, US). **Lima:** Prov. Chancay, Huaccaña, cerro al este de Supe, *Cerrate 1062* (USM). **Pasco:** Prov. Oxapampa, Canyon of Huancabamba, Fundo La Esperanza, *León 617* (F, GH, USM). Prov. Oxapampa-Pasco, below San Gotardo, *Werff et al. 8521* (NY, UC). **Junín:** Carpapata, above Huacapistana, *Killip & Smith 24429* (NY, US). Chanchamayo, *C. Schunke* (BM, F). Prov. Chanchamayo, Río Rondayacu, *D. Smith 2117* (USM). **Ayacucho:** Aina, between Huanta and Río Apurímac, *Killip & Smith 22588* (BM). **Cuzco:** Prov. La Convención, Dist. Vilcabamba, trail from Yupanqui to Apurímac, *Dudley 1231* (GH). Prov. Urubamba, Machu Picchu, *Ferreira 2707* (BM, USM). Prov. Paucartambo, Parque Nacional Manú, *León 2130* (F, USM). **Puno:** Prov. Sandia, Limbani a Chacani, *Vargas 14936* (GH).

12. *Campyloneurum vulpinum* (Lindman) Ching, *Sunyatsenia* 5: 263. 1940.

Polypodium vulpinum Lindman, *Ark. Bot.* 1: 245. 1903. *Nom. nov.* for *Polypodium laevigatum* var. *crispatum* C. Chr., and with the same type, not *Polypodium crispatum* L. 1753.

Polypodium laevigatum var. *crispatum* C. Chr., *Bot. Tidsskr.* 25: 79. 1902. TYPE: Brazil, Minas Gerais, Serra de Caldas, *Mosén 2220* (holotype, c; isotypes, BM!, s!, us!; photo, BM of s).

Epiphytic. **Stem** long-creeping, 1–2 mm wide, with reddish-brown, linear-lanceolate scales, less than 1 mm wide, with cell walls conspicuously thinner toward the margin. **Leaves** 15–35 cm long, 7–15 mm apart, petiole 2.5–8(–10) cm long, stramineous or greenish stramineous. **Lamina** linear-lanceolate or narrowly lanceolate, herbaceous, slightly chartaceous, 1.5–3 cm wide, with attenuate base, with slightly cartilaginous, sinuate margins, with acuminate apex, indument scarce, of simple trichomes. **Costa** prominent, primary veins obscure or slightly prominulous, more or less colorous with the adjacent tissue, 4–8 mm apart, diverging 50–60° from the costa, with areoles between costa and margin 2–4, with 1–3 veinlets in

each areole. **Sori** subterminal on the excurrent veinlets, paraphyses dendritic.

Growing in shady and humid places on tree trunks or in rock crevices, often in montane forests, (600–)1200–2100 m, Amazonas, San Martín, Huánuco, Pasco, Junín, Ayacucho.

Haiti; Dominican Republic; Ecuador to Bolivia; Brazil.

Amazonas: Prov. Bagua, 12 km E of La Peca, *Barbour* 2585 (F, MO, NY, UC). **San Martín:** Prov. Rioja, *D. Smith* 4364 (MO). **Huánuco:** Muña, *Bryan* 421 (F, GH), *Woytkowski* 5218 (GH). Río Huallaga, below Santo Domingo, *Macbride* 4208 (F). **Pasco:** Prov. Oxapampa, 5 km SE of Oxapampa, *León* 506 (USM). **Junín:** Yucapata, *Woytkowski* 6658 (US). **Ayacucho:** Prov. Huanta, Ccarrapa, between Huanta and Río Apurímac, *Killip & Smith* 22386 (NY), 22401 (NY).

13. **Campyloneurum chlorolepis** Alston, Bull. Jard. Bot. Etat 27: 56. 1957. TYPE: Colombia, Caldas, Chinchina (Pereira-Manizales), *Koie* 5208 (holotype, not found; photo, BM of c).

Polypodium angustifolium var. *heterolepis* Rosenst., Mém. Soc. Neuchâtel 5: 54. 1912. TYPE: Colombia, Antioquia, near Angelópolis, *Mayor* 140 (holotype, p!; isotypes, s!, ucl, us!).

Campyloneurum heterolepis (Rosenst.) Lell., Amer. Fern J. 67: 58. 1977.

Epiphytic, or rarely terrestrial. **Stem** creeping, 3–4(–5) mm wide, rarely pruinose, the scales whitish, linear-lanceolate. **Leaves** pendulous or rarely erect, 40–85 cm long, 1–2 mm apart, petiole 4–8(–10) cm long, stramineous or brown. **Lamina** linear or narrowly lanceolate, herbaceous-chartaceous, 1–3(–5) cm wide, with narrow cuneate or attenuate base, with slightly revolute, cartilaginous margins, with acute or acuminate apex, indument of inconspicuous simple trichomes, scarce abaxially. **Costa** prominent; primary veins inconspicuous or when dry the color darker than the leaf tissue, 5–8 mm apart, diverging 50–60° from the costa, with 2–4 areoles between costa and margin, with 2–4 veinlets in each noncostal areole, anastomosing veinlets forming secondary areoles. **Sori** subterminal on the free excurrent veinlet, paraphyses inconspicuous or lacking.

In low and premontane forests, 200–1000(–1800) m, Amazonas, San Martín, Loreto, Huánuco, Junín, Ayacucho, and Madre de Dios.

Venezuela, Colombia to Bolivia and Brazil.

Amazonas: Al lado de Huampaní, *Kayap* 1206 (MO). **San Martín:** Km 21–22 of Tarapoto–Yurimaguas road, *Knapp et al.* 7883 (MO, NY, USM). Prov. Mariscal Cáceres, NW del caserío Nuevo Progreso, *J. Schunke* V. 3241 (GH, NY, US, USM). Prov. Tocache, Dist. Tocache Nuevo, Quebrada de Almendras, *J. Schunke* V. 4453 (F, GH, US). **Loreto:** Río Corrientes, between Teniente López and Puesto Avanzado, *Gentry et al.* 19057 (F, MO, USM). **Huánuco:** Tingo María, *Solomon* 3389 (MO). **Junín:** Prov. Satipo, Colonia del Perené, *Killip & Smith* 25089 (F). Chanchamayo valley, *C. Schunke* 124 (US), *Soukup* 1102 (F). **Ayacucho:** Río Apurímac valley, near Kimpitiriki, *Killip & Smith* 22890 (NY, US). **Madre de Dios:** Prov. Manú, Atalaya, vicinity of Hacienda Amazonía, *Foster & Wachter* 7417 (USM). Atalaya, *Núñez* 6866 (MO).

14. **Campyloneurum aglaolepis** (Alston) Sota, Opera Lilloana 5: 96. 1960.

Polypodium aglaolepis Alston, J. Bot. 77: 346. 1939.

TYPE: Argentina, Tucumán, Siambón, *Lorentz & Hieronymus* 948 (holotype, BM!; isotype, CORD).

Epiphytic. **Stem** short creeping, 2–3(–4) mm wide, green or green stramineous, with narrowly lanceolate or triangular-lanceolate, brown or grayish-brown in mass scales. **Leaves** pendent, 30–50(–60) cm long, 2–4 mm apart, petiole 2–4(–8) cm long, stramineous. **Lamina** linear-lanceolate, 0.5–1.5 cm wide, with attenuate base, with revolute or plane, cartilaginous margins, with acuminate apex. **Costa** prominent, primary veins obscure on both sides, or prominulous adaxially and more or less obscure abaxially, concolorous with the adjacent tissue, diverging 40–60° from the costa, 3–5 mm apart, with 2(–3) areoles between costa and margin, with 1 veinlet in each areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses inconspicuous or lacking.

In dense tufts on tree trunks or in shady crevices of rocks, in humid montane forest, 1200–3600 m, Cuzco and Puno.

Peru; Bolivia; Brazil; Argentina.

Cuzco: Piñasnioj, “Panticalla” (Pantiacolla) pass, *Cook & Gilbert* 1826 (us). Prov. Quispicanchis, Marcapata, Cadena, *Vargas* 11665 (F). **Puno:** Prov. Carabaya, abajo de Ollachea, *Vargas* 6885 (UC, US).

15. **Campyloneurum angustifolium** (Sw.) Fée (Mem. foug. 5), Gen. fil. 257. 1852.

Polypodium angustifolium Sw., Prodr. 130. 1788.

TYPE: Jamaica, *Swartz* (holotype, s!; isotypes, BM!, LD!, s!).

Polypodium taeniosum Willd., Sp. 5, 155. 1810. TYPE:

Venezuela, Caripe, *Humboldt* (holotype, B!, *Herb. Willd.* 19631; photos, BM, USM).

Marginaria angustifolia (Sw.) Presl, Tent. pterid. 188. 1836.

Campyloneurum taeniosum (Willd.) Fée (Mém. foug. 5), Gen. fil. 257. 1852.

Polypodium angustifolium var. *gramineum* Sodiro, Crypt. vasc. Quit. 366. 1893. TYPE: Ecuador, Pichincha-Manabí, a lado del Río Suma [as Zuma], Cáceres (holotype, P; photo, BM).

Epiphytic or epipetric. **Stem** creeping, (1.5–)2–3 mm wide, pruinose or not, the scales brown, lanceolate or narrowly lanceolate. **Leaves** partially erect or pendent, 25–60(–70) cm long, 1–4 mm apart, petiole 1–5 cm long, brown-stramineous. **Lamina** linear or narrowly lanceolate, chartaceous or subcoriaceous, 0.5–1.5(–2.5) cm wide, with attenuate base, with revolute or plane, cartilaginous margins, with acuminate apex. **Costa** prominent, with caducous scales; primary veins obscure or usually of different color than the lamina tissue abaxially, 4–6 mm apart, with 1–2 areoles between costa and margin, with 1 free veinlet in each areole. **Sori** medial or subterminal on the excurrent veinlets, paraphyses scarce, simple.

Forming clumps on tree trunks or in crevices of rocks, in open or shady places from low to montane forests, 100–2500(–3600) m, Lambayeque, Cajamarca, Amazonas, La Libertad, San Martín, Loreto, Huánuco, Pasco, Junín, Ucayali, Ayacucho, and Cuzco.

Southern Florida; Central America; Greater Antilles; Colombia to Bolivia and Brazil.

This species is closely related to *C. aglaolepis* and *C. angustipaleatum*.

Lambayeque: Prov. Ferreñafe, Tute, *Llatas Quiroz* 2514 (F). **Cajamarca:** Prov. Jaen, alrededor de Chontali, *Llanos & Chimoy s.n.* (USM). **Amazonas:** Prov. Bagua, ca. 1 km NE of Quebrada Chingunza, *Knapp & Alcorn* 7732 (F, NY). **La Libertad:** Prov. Otuzco, Huaranchal, *López et al.* 2693 (GH). **San Martín:** Prov. Mariscal Cáceres, 6 km NE of Tingo María, *Tryon & Tryon* 5273 (GH, US). **Loreto:** Prov. Maynas, Lupuna Cocha, *Tryon & Tryon* 5187 (BM, F, GH, US, USM). **Huánuco:** Prov. Pachitea, Dist. Honoria, Bosque Nacional Iparía, Isla del Pacanasi, *J. Schunke V.* 2322 (F, GH). Tingo María, at confluence of Huallaga and Monzón rivers, *Stork & Horton* 9493 (UC, US). **Pasco:** Prov. Oxapampa, 5 km SE of Oxapampa, *D. Smith* 3653 (F, MO, NY, USM). **Junín:** Río Pinedo, N of La Merced, *Killip & Smith* 23647 (F, GH, NY, US). **Ucayali:** Prov. Coronel Portillo, Bosque Nacional Alexander von Humboldt, *Gentry et al.* 41417 (MO, USM). **Ayacucho:** Prov. La Mar, Ayna, between Huanta and Río Apurímac, *Killip & Smith* 22588 (F). **Cuzco:** Prov. Paucartambo, entre Mistiana y Keros, valle de Cosñipata, *Scolnik* 882 (US).

16. *Campyloneurum angustipaleatum* (Alston) Lellinger, Amer. Fern J. 74: 56. 1984. **Figure 11c.**

Polypodium angustipaleatum Alston, J. Bot. 77: 346. 1939. TYPE: Bolivia, Prov. Cochabamba, vic. Cochabamba, *Bang* 1288 (holotype, BM!; isotypes, B!, F!, US).

Epiphytic. **Stem** creeping, 1–2 mm wide, dark green not pruinose, the scales dark brown, clathrate, cell walls of uniform thickness, linear from a round base, less than 1 mm wide. **Leaves** pendent, 40–80 cm long, 2–4 mm apart, petiole 0.5–4 cm long, stramineous, glabrate. **Lamina** linear, herbaceous-chartaceous, 0.5–1(–1.5) cm wide, with attenuate base, with plane or slightly revolute, slightly cartilaginous margins, with acuminate apex, indument inconspicuous or lacking. **Costa** prominent; primary veins obscure, diverging 60–65° from the costa, with 1–2(–3) areoles between costa and margin, with 1 veinlet in each areole. **Sori** medial or submedial, paraphyses inconspicuous or lacking.

Usually in shady places in forests, rarely in areas of remnant forests, 650–2900 m, Cajamarca, Amazonas, San Martín, Huánuco, Pasco, Junín, Cuzco, and Puno.

Colombia to Bolivia.

Cajamarca: Prov. Jaen, Colasay, *Woytkowski* 6941 (GH, MO). **Amazonas:** Prov. Chachapoyas, along Río Ventilla, 1–2 km W of Molinopampa, *Wurdack* 1503 (F, GH, NY, UC, US, USM). **San Martín:** Prov. Rioja, Pedro Ruiz-Moyobamba road, km 390, Venceremos, *D. Smith & Vásquez* 4630 (MO, NY). **Huánuco:** Prov. Pachitea, near bridge Oxapampa–Pozuzo road, *Skog et al.* 5094 (NY). **Pasco:** Prov. Oxapampa, ca. 3 km NE del Puente Paucartambo, camino a Oxapampa, *León* 624 (F, USM). **Junín:** Prov. Tarma, Utcuyacu, *Woytkowski* 37006 (MO, S, UC). **Cuzco:** Prov. Convención, valle de Santa Ana, *Plowman & Davis* 4800 (F, GH). **Puno:** Prov. Carabaya, km 62 road Macusani–San Gabán, *Maas et al.* 6051 (USM).

17. *Campyloneurum phyllitidis* (L.) Presl, Tent. pterid. 190. 1836. **Figure 11b.**

Polypodium phyllitidis L., Sp. pl. 2: 1083. 1753. LECTOTYPE (chosen by Proctor, Pteridophyta, p. 341, in Howard, Flora Lesser Antilles, vol. 2. 1977): Plumier, Descr. pl. Amer. t. 38. 1705.

Cyrtophlebium phyllitidis (L.) John Sm., J. Bot. (Hooker) 4: 58. 1841.

Polypodium laevigatum var. *rigidum* Harr., J. Linn. Soc. Bot. 16: 36. 1877. LECTOTYPE (designated by Price, Contr. Univ. Michigan Herb. 15: 203. 1982): Peru, Amazonas, Río Utcubamba, Jul. 1872, *Steere s.n.* (MICH!).

Polypodium phyllitidis var. *elongata* Hieron., Bot. Jahrb. Syst. 34: 534. 1904. SYNTYPES: Colombia, Prov. Tolima, Río Paez, *Lehmann* 5721 (B); Ecuador, Cerro Yanghuan, *Lehmann* 7679 (B!).

Epiphytic, hemiepiphytic, or terrestrial. **Stem** (4)–6–15 mm wide, not pruinose, scales brown, triangular-lanceolate, clathrate. **Leaves** (45)–60–150 cm long, 2–6(–7) mm apart; petiole almost absent to 10 cm long, sulcate or slightly sulcate adaxially, stramineous or brownish. **Lamina** oblanceolate or lanceolate, chartaceous or subcoriaceous, (2.7)–5–16 cm wide, with attenuate base, with slightly sinuate, plane or slightly revolute, cartilaginous margins, with acuminate or subcaudate apex, indument of scarce, simple trichomes, spreading abaxially. **Costa** prominent, sometimes with scales similar to those of the stem; primary veins prominent or prominulous on both sides of the lamina, straight, usually lighter in color than the adjacent tissue, (5)–6–10 mm apart, diverging (55)–60–70° from the costa, secondary veins obsolete, with (6)–8–16 areoles between costa and margin, with 3(–4) free excurrent veinlets in each noncostal primary areole, the central excurrent veinlet connected with the transverse veinlets forming isodiametric secondary areoles. **Sori** subterminal or terminal on the excurrent veinlets, paraphyses inconspicuous or lacking.

In shady or open places, in montane or lowland forests, 100–2500 m, Piura, La Libertad, San Martín, Loreto, Huánuco, Junín, Cuzco, and Madre de Dios.

Southern United States (Florida); Central America; West Indies; Colombia and Venezuela to Bolivia and central Brazil.

I recognize *Campyloneurum phyllitidis* as distinct from *C. brevifolium* based on venation characters; the former has isodiametric areoles at the middle of the lamina and two rows of sori between the primary veins. Lellinger (1988) pointed out the inconstant venation in specimens of both species from Central and South America and the need for studies on the development of the leaves to clarify the confusion.

Piura: Prov. Huancabamba, carretera entre Canchaque y Huancabamba, *Díaz & Baldeón* 2394 (MO, NY, USM). **La Libertad:** Prov. Otuzco, Chuquizongo, *López et al.* 2630 (GH). **San Martín:** Tarapoto, *Woytkowski* 35070 (MO, UC). **Loreto:** Prov. Alto Amazonas, above Pongo de Manseriche, left bank of Río Santiago, *Mexia* 6324 (F, GH, MO, NY, S, UC). **Huánuco:** Prov. Pachitea, Honoria, Bosque Nacional Iparia, 1 km arriba de Tournavista, *J. Schunke* V. 2181 (F, GH, NY). **Junín:** Prov.

Satipo, Alto Quimiriqui, *León* 278 (AAU, F, USM). **Cuzco:** Prov. Convención, Quillabamba, 150 km NW from Cuzco, *Núñez et al.* 6772 (MO). **Madre de Dios:** Prov. Manú, Parque Nacional Manú, Cocha Cashu Biological Station, *M. Foster* P-84-68 (MO, UC).

18. *Campyloneurum brevifolium* (Link) Link, Fil. spec. 124. 1841.

Polypodium brevifolium Link, Hort. berol. 90. 1833.

TYPE: Based on cultivated plants (holotype, B!).

Campyloneurum latum Moore, Index fil. 225. 1861.

LECTOTYPE (designated by Proctor, Pteridophyta, p. 342, in Howard, Flora Lesser Antilles, vol. 1977: Windward Islands, St. Vincent, *Guilding* (K!).

Polypodium phyllitidis var. *latum* (Moore) Hook., Sp. fil. 5: 38. 1864.

Polypodium latum (Moore) Sodirol, Crypt. vasc. Quit. 371. 1893.

Terrestrial, hemiepiphytic or epiphytic. **Stem** creeping, not pruinose, (4)–6–17(–24) mm wide, the scales usually light brown, ovate-lanceolate. **Leaves** erect, (35)–40–120 cm long, 1–4(–10) mm apart, petiole (2)–5–28 cm long, stramineous or brownish, indument of rather persistent broad scales similar to those of the stem. **Lamina** elliptic-lanceolate, chartaceous or subcoriaceous, 6–13.5 cm wide, with attenuate or subcuneate base, with cartilaginous margins, with usually acuminate, sometimes subcaudate apex, indument of inconspicuous, entire trichomes, spreading abaxially. **Costa** prominent, slightly sulcate abaxially, convex or slightly angulate abaxially, sometimes with spreading ovate-lanceolate scales; primary veins prominent on both surfaces, straight or slightly flexuous, diverging 70–75° from the costa, (4)–6–9(–13) mm apart, with 8–18 areoles between costa and margin, 2–5 veinlets in each noncostal areole, free or anastomosing forming usually irregular secondary areoles. **Sori** medial or subterminal, paraphyses inconspicuous or lacking.

In shady and humid places, in disturbed humid forests, sometimes in rocky places, 100–1300 m, San Martín, Loreto, Huánuco, Pasco, Junín, Cuzco, Madre de Dios, and Puno.

Central America; West Indies; Colombia and Venezuela to Bolivia and Central Brazil.

Campyloneurum brevifolium is the correct name for the species commonly known as *C. latum*. The type of the former is a specimen with one sterile leaf that displays the venation character that is distinctive in this species: the noncostal primary areoles are irregularly divided. One additional specimen of Link's species is found at B, which

has a short-creeping stem and three closely spaced leaves, plus one irregular apically branched leaf. A photograph of this specimen at BM is erroneously labeled as the type.

Campyloneurum brevifolium usually occurs in the same areas as *C. phyllitidis*, from which it can be distinguished by the characters provided in the key. See discussion under *C. phyllitidis*.

Campyloneurum brevifolium is also closely related to *C. pascoense*. Both species have a similar pattern of venation; however, in the former species secondary veins are not prominulous.

San Martín: Prov. Mariscal Cáceres, Dist. Campanilla, Mashuyacu, *J. Schunke* V. 4225 (GH, US). Prov. Rioja, Río Negro, *Soukup* 5146 (GH). **Loreto:** Prov. Maynas, 12 km SW of Iquitos, *Croat* 18257 (F, UC, USM). Prov. Alto Amazonas, Yurimaguas, lower Río Huallaga, *Killip & Smith* 27668 (F, s, US). **Huánuco:** Prov. Huánuco, near confluence of Río Cayumba with Huallaga, *Mexia* 8272 (BM, F, UC, s). **Pasco:** Prov. Oxapampa, Palcazú valley, *D. Smith* 3874 (MO, UC). **Junín:** Prov. Satipo, Puente Perené, *Coronado* 253 (GH, UC, US). **Cuzco:** Prov. Convención, Potrero, 8 km W of Quillabamba, *Tryon & Tryon* 5393 (BM, F, GH, US). **Madre de Dios:** Prov. Manú, Río Palotoa, tributary of Alto Madre de Dios, NW of Shintuya, *Foster & Terborgh* 6759 (F). **Puno:** Prov. Carabaya, Hacienda Palmera-Inambari, *Vargas* 16149 (GH).

19. *Campyloneurum pascoense* R. & A. Tryon, *Rhodora* 84: 125. 1982. TYPE: Peru, Pasco (as Junín), Oxapampa, *Soukup* 2340 (holotype, GH!; isotype, F!).

Terrestrial. **Stem** long-creeping, 10–20 mm wide, not pruinose, the scales brown, ovate-lanceolate. **Leaves** 1.5–2 m long, 15–25 mm apart, petiole 8–14 cm long, brown or red-brown. **Lamina** lanceolate, chartaceous, 10–20 cm wide, with attenuate or cuneate base, with cartilaginous, slightly sinuate margins, with acuminate or subcaudate apex, indument inconspicuous or lacking. **Costa** prominent, indument of sparse scales similar to those of the stem; primary veins prominent on both surfaces, stramineous, straight, (6–)9–11 mm apart, diverging 70–75° from costa, veinlets prominulous to prominent, with 12–20 primary areoles between costa and margin, with 3–7 veinlets in each non-costal areole, free or anastomosing, excurrent or sometimes decurrent. **Sori** subterminal or com-pital, paraphyses threadlike.

Key to Varieties

- a. Lamina coriaceous, usually less than 5 cm wide 20a. var. **nitidissimum**
- a. Lamina herbaceous to chartaceous, usually more than 5 cm wide 20b. var. **latior**

In shady, very disturbed areas, usually in rem-nant or patches of montane forests, 1600–2500 m, Cajamarca, Amazonas, San Martín, Huánuco, Pasco, Ayacucho, and Cuzco.

Ecuador to Bolivia.

Cajamarca: Prov. Chota, Huambos, *Soukup* 4488 (US). **Amazonas:** Prov. Bagua, Cordillera Colán, SE of La Peca, *Barbour* 4187 (F). **San Martín:** Prov. Mariscal Cáceres, Parque Nacional Río Abiseo, Río Montecristo water-shed, hill E from Pajaten ruins, *Young* 4323 (NY). **Huánuco:** Prov. Pachitea, Huacachi, near Muña, *Macbride* 4082 (F, US). Prov. Huánuco, km 468 on Lima–Tingo María road, above San Miguel Chinchao, *Young & Sullivan* 619 (MO, NY, UC). **Pasco:** Prov. Oxapampa, Cordillera Yanachaga, road over shoulder of Cerro Pajonal to Villa Rica, *Foster & Smith* 9071 (F, MO). **Ayacucho:** Prov. La Mar, San Miguel, Urubamba valley, *Cook & Gilbert* 1756 (US). **Cuzco:** Prov. Urubamba, Machu Picchu station, *Hutchison* 1760a (UC).

20. *Campyloneurum nitidissimum* (Mett.) Ching, *Sunyatsenia* 5: 263. 1940.

Terrestrial, rarely epiphytic. **Stem** long-creep-ing, not pruinose, 8–10 mm wide, the scales dark brown, linear-lanceolate. **Leaves** 60–90 cm long, 4–9 mm apart, petiole 17–25 cm, dark strami-neous, glabrate. **Lamina** narrowly lanceolate, co-riaceous, 4–8 cm wide, the base attenuate or slight-ly cuneate, then decurrent, with plane or scarcely revolute, cartilaginous margins, with acute or acu-minate apex, glabrate. **Costa** prominent, slightly sulcate adaxially, plane or angulate abaxially; pri-mary veins prominent on both sides of the lamina, diverging 60–65° from the costa, with 7–12 areoles between costa and margin, with 3–4 veinlets in each areole, simple or furcate, free or anastomos-ing, usually slightly prominulous. **Sori** subtermi-nal on the excurrent veinlets, paraphyses incon-spicuous or lacking.

Leaves in *C. nitidissimum* are characterized by the coriaceous texture, petiole length variable from approximately half the size of the lamina to less than ¼, and venation with secondary areoles sim-ilar to those in *C. brevifolium*.

I recognize *Campyloneurum nitidissimum* with two varieties.

20a. *Campyloneurum nitidissimum* var. *nitidissimum*.

Polypodium nitidissimum Mett., Ann. Sci. Nat. V, 2: 258. 1864. TYPE: Colombia, San Antonio, Jan. 1861, Lindig 363 (holotype B!; isotypes, BM!, K!; frag., US! of BM).

Variety *nitidissimum* is only known from the type specimen from Colombia and two Peruvian specimens.

Huánuco: Muña, Macbride 4040 (F, GH, NY, US). Dept. unknown: Ruiz 12 (B).

20b. *Campyloneurum nitidissimum* var. *latior* (Rosenst.) B. León, *comb. nov.*

Polypodium nitidissimum var. *latior* Rosenst., Repert. Spec. Nov. Regni Veg. 12: 474. 1913. TYPE: Bolivia, Yungas Septentrionalis, Coroico, Buchtien 3526 (holotype, not located; isotypes, F!, S!, US!).

In open and disturbed areas of montane forest, (1000-)1200–2100 m, Huánuco, Pasco, and Junín. Colombia to Bolivia.

Huánuco: Río Cayumba with Huallaga, Mexia 8272a (UC). Pasco: Prov. Oxapampa, Cañón del Huancabamba, entre Quebrada Honda y Tunqui, León 667 (F, USM). Junín: Prov. Chanchamayo, aprox. 12 km de San Ramón, camino a Tarma, antes de Carpapata, León 340 (F, USM).

21. *Campyloneurum abruptum* (Lindm.) B. León, *comb. nov.*

Polypodium repens var. *abruptum* Lindm., Ark. Bot. 1: 245. 1903. TYPE: Brazil, Matto Grosso, Serra do Itapirapuum, Lindman (Regnell Exped. I) 3345 (holotype, S!; isotype, K!).

Campyloneurum nitidissimum var. *abruptum* (Lindm.) León, Ann. Missouri Bot. Gard 77: 212, 865. 1990.

Terrestrial or hemiepiphytic. Stem creeping, not pruinose, 5–10 mm wide, scales blackish, linear-lanceolate. Leaves erect, 60–110 cm long, 2–5 mm apart, petiole 2–7 cm long, dark stramineous, glabrate. Lamina lanceolate or elliptic-lanceolate, chartaceous or herbaceous-chartaceous, (4.5–)6.5–13.5 cm wide, with usually abruptly cuneate or attenuate, then decurrent base, with slightly sinuate, cartilaginous margins, with usually acuminate apex, indument of inconspicuous, unicellular trichomes, spreading abaxially. Costa prominent, slightly sulcate on the adaxial side, indument of

caducous scales; primary veins prominent, straight, lighter in color than the adjacent tissue, diverging (60–)65–70° from the costa, (3–)5–7(–10) mm apart, with 9–15 areoles between costa and margin, with 2–4 excurrent veinlets in each noncoastal areole, veinlets entire or furcate, usually free, rarely forming irregular secondary areoles. Sori subterminal on the excurrent veinlet, paraphyses inconspicuous or lacking.

In shady and humid places, with mosses or abundant organic debris, sometimes on rocks, rarely in exposed areas, in ravines of humid forests, 100–1900 m, San Martín, Junín, and Madre de Dios.

Colombia and Venezuela, south to Bolivia and Brazil.

Campyloneurum abruptum was misidentified as *C. coarctatum* because of leaf morphology; however, stem diameter and stem scale characters are very different in these species.

Campyloneurum abruptum has primary areoles mostly undivided, with 2 excurrent veinlets; however, more veinlets may occur in each areole, and one of these can be connected to the transverse veins. *Campyloneurum abruptum* appears to be closely related to *C. phyllitidis*. In Peru, *C. abruptum* is commonly found at low elevations, and the base of leaves is usually abruptly attenuate, with the base of the lamina decurrent along the petiole.

San Martín: Chazuta, Río Huallaga, Klug 4080 (BM, F, GH, NY, S, UC, US); 15 km E of Shapaja, along Quebrada Chumia, Knapp 7867 (MO, USM). Prov. Mariscal Cáceres, Campanilla, Mashuyacu, J. Schunke V. 4226 (F, US). Junín: E of Quimiri bridge, near La Merced, Killip & Smith 24004 (NY, US). Madre de Dios: Prov. Tambopata, SE de Puerto Maldonado, bosque del Albergue "Cuzco Amazónico," León 884 (F, USM).

Comments

Campyloneurum solutum (Klotzsch) Fée (Mém. foug. 5) Gen. fil. 258. 1852.

Polypodium solutum Klotzsch, Linnaea 20: 399. 1847. LECTOTYPES (designated here): Without exact locality, Hartweg 1493 (B!; isolectotype, BM!, LD!). *Polypodium nodosum* Klotzsch, Linnaea 20: 400. 1847. TYPE: Colombia, Páramo de la Culata, Moritz 310 (holotype, B!; isotype, BM!).

Campyloneurum nodosum (Klotzsch) Fée (Mém. foug. 5) Gen. fil. 258. 1852.

Campyloneurum jamesonii Fée (Mém. foug. 5) Gen. fil. 259. 1852. TYPE: Ecuador, Pichincha, Quito, Jameson (holotype, not found; isotype, BM!).

Polypodium angustifolium var. *solutum* (Klotzsch)
Christ, Denkschr. Kaiserl. Akad. Wiss. Math. Naturwiss. Kl. 79: 42. 1908.
Campyloneurum angustifolium var. *solutum* (Klotzsch)
Farw., Amer. Midl. Naturalist 12: 296. 1931.

This species has been recorded from Colombia and Ecuador where it grows above 3000 m elevation in open rocky areas and may occur in northern Peru. It is closely related to *Campyloneurum amphotenson*, especially in pattern of venation, pruinose condition, and diameter of the stem. However, it differs from the latter species in the character of the stem scales. In *C. solutum* the stem scales are slightly clathrate, 5–7 mm long, 1.5–2 mm wide, base auriculate. The leaf is long-petiolate and lanceolate, but smaller than those found in *C. amphotenson*.

VIII. *Niphidium*

Niphidium John Sm., Hist. fil. 99. 1875. TYPE: *Niphidium americanum* (Hooker) John Sm. (*Polypodium americanum* Hooker) = *Niphidium longifolium* (Cav.) Morton & Lell. **Figure 12.**

Plants terrestrial, epiphytic, or sometimes epipetric. **Stem** slender to rather stout, short- to long-creeping, provided with clathrate scales, when epiphytic usually with a dense mat of soft roots, when terrestrial with many long fibrous roots. **Leaves** monomorphic, mature ones 25–125 cm long, articulate, phyllopodia short or obsolete. **Lamina** simple and entire, oblong to linear-lanceolate, na-

ked to slightly scaly (rarely densely so), the adaxial surface provided with dark or white-encrusted hydathodes. **Veins** anastomosing, with free, included veinlets. **Sori** round to sometimes oblong, borne at the juncture of veins, in a single series between the principal lateral veins and in two or more rows on each side of the midrib, paraphysate or not. **Receptacle** somewhat raised. **Indusium** lacking, the sporangia sometimes bearing trichomes. **Spores** monolete, bilateral, smooth, hyaline.

Niphidium is confined to the Neotropics and 7 of its 10 species are Andean. It is distinguished by long, simple leaves, anastomosing veins with included, free veinlets, and roundish, exindusiate sori borne in a single series between the prominent, straight, main lateral veins. Although the genus is easily recognized, the task of separating species is not so simple. One of the principal diagnostic characters deals with subtle differences in the stem scales, and another with the thickness and length of the stems. Therefore, the scales must be very carefully examined and, furthermore, specimens lacking stems usually cannot be accurately identified. Of nearly 300 specimens examined during this study, nearly 30 could not be identified with certainty.

The treatment that follows is based principally on the recent revision of Lellinger (1972).

Reference

LELLINGER, D. B. 1972. A revision of the fern genus *Niphidium*. Amer. Fern J., 62: 101–120.

Key to Species of *Niphidium*

- a. Stems 3–5(–6) mm in diameter; midrib scales persistent; primary veins abaxially not or slightly raised, most of them darker than the lamina b
- b. Stem scales usually appressed throughout, attached well above the base, less than 3 mm long, with erose, often fimbriate, margins; plants most commonly epiphytic 6. ***N. anocarpos***
- b. Stem scales with tips usually spreading, attached near the base, at least 4 mm long, with erose or often ciliolate margins; plants most commonly epipetric 5. ***N. vittaria***
- a. Stems (6–)8–15 mm in diameter; midrib scales deciduous or lacking, rarely persistent; primary veins abaxially raised, often lighter in color than the lamina c
- c. Sporangia naked; apex of stem scales filiform and often contorted 4. ***N. macbridei***
- c. Sporangia capsules bearing few to 12 stout, 1–2-celled trichomes; apex of stem scales acute to attenuate d
- d. Stem scales not or scarcely clathrate (the lumina small and occluded), longitudinally somewhat involute toward the apex, especially on those scales near the petiole base ... 3. ***N. carinatum***
- d. Stem scales strongly and obviously clathrate (their lumina translucent), essentially plane throughout e

- e. Lumina of the central portion of stem scales obviously elongate, often $3-5\times$ as long as broad; plants epiphytic, very rarely epipetric 1. *N. crassifolium*
 e. Lumina of the central portion of stem scales essentially isodiametric, or toward the apex slightly elongate ($1-2\times$ as long as broad); plants terrestrial or epipetric, rarely epiphytic 2. *N. albopunctatissimum*

1. *Niphidium crassifolium* (L.) Lell., Amer. Fern J. 62: 106. 1972. Figures 12a-b.

Polypodium crassifolium L., Sp. pl. 1083. 1753. LECTOTYPE (designated by Lellinger, 1972): Petiver, "Pteri-graphia Americana," t. 6, f. 1. 1712. For additional synonymy, see Lellinger (1972, p. 106).

Plants epiphytic, very rarely epipetric. **Stem** creeping, 6-12 mm in diameter, rarely pruinose, provided with lanceolate-acuminate scales, these 8-12 mm long, plane throughout, conspicuously clathrate, usually strongly bicolorous, the central portion blackish, the margins pale brown, entire or repand, lumina of the central portion conspicuously elongate, the distal ones often 3-5 times longer than broad. **Leaves** crowded, to 1.5 cm apart, on phyllopodia 5 mm long. **Petiole** 3-16(-30) cm long. **Lamina** narrowly lanceolate or oblanceolate, attenuate or acuminate at base, acute or rounded at apex, 40-80 cm long, (3.5-)5-12 cm broad, provided adaxially with brown hydathodes, these rarely with a white encrustation. **Midrib** scales deciduous or lacking, rarely seen. **Primary veins** abaxially raised, often lighter in color than the laminar tissue. **Sori** in (6-)7-14 rows on each side of the midrib (at widest part of lamina). **Sporangia** with a few to 10, stout, 1-2-celled trichomes on the capsule.

In or at edges of forests, on trunks and branches of trees, very rarely among rocks, 100-2100(-2600) m, Tumbes to Loreto, south to Puno.

Neotropics.

This is the only South American species of *Niphidium* that also occurs elsewhere. Scarcely distinct from it is *N. albopunctatissimum* (see further discussion below).

Herrera 3284 (us) from Cuzco, at 2200 m, at first appears to be *N. macbridei* as it has very small, narrow leaves and stem scales typical of the latter. But sporangia have conspicuous trichomes, so it is perhaps a depauperate or precociously fertile specimen of *N. crassifolium*.

Tumbes: Prov. Zaramilla, Bosque Nacional de Tumbes, *Schunke V. 2381* (F, GH). **Cajamarca:** Prov. Contumazá, between Cascas and Contumazá, *Sagástegui et al. 9108* (GH, MO). **Amazonas:** Prov. Bongará, El Ingenio, *Sagástegui 5959* (GH, HUT). Prov. Chachapoyas, slopes of Pumarucu, *Wurdack 553* (F, UC, US, USM). **San Martín:** Prov. Mariscal Cáceres, Dist. Tocache Nuevo, left bank of Río Huallaga, *Schunke V. 3636* (F, GH). **Loreto:** Above Pongo de Manseriche, *Mexia 6195a* (F, GH, MO, UC). **Pasco:** Prov. Oxapampa, km 36-37, road to Oxapampa, *León 479* (USM). **Junín:** Chanchamayo, San Ramón, near La Merced, *Teppner 73/207* (us). **Cuzco:** Machu Picchu, *Cook & Gilbert 864* (GH, US). **Puno:** La Pampa, Río Tavera, *Watkins* (us).

2. *Niphidium albopunctatissimum* Lell., Amer. Fern J. 62: 109. 1972. TYPE: Bolivia, Prov. La Paz, Apolo, R. S. Williams 1062 (holotype, NY; isotypes, GH!, US!).

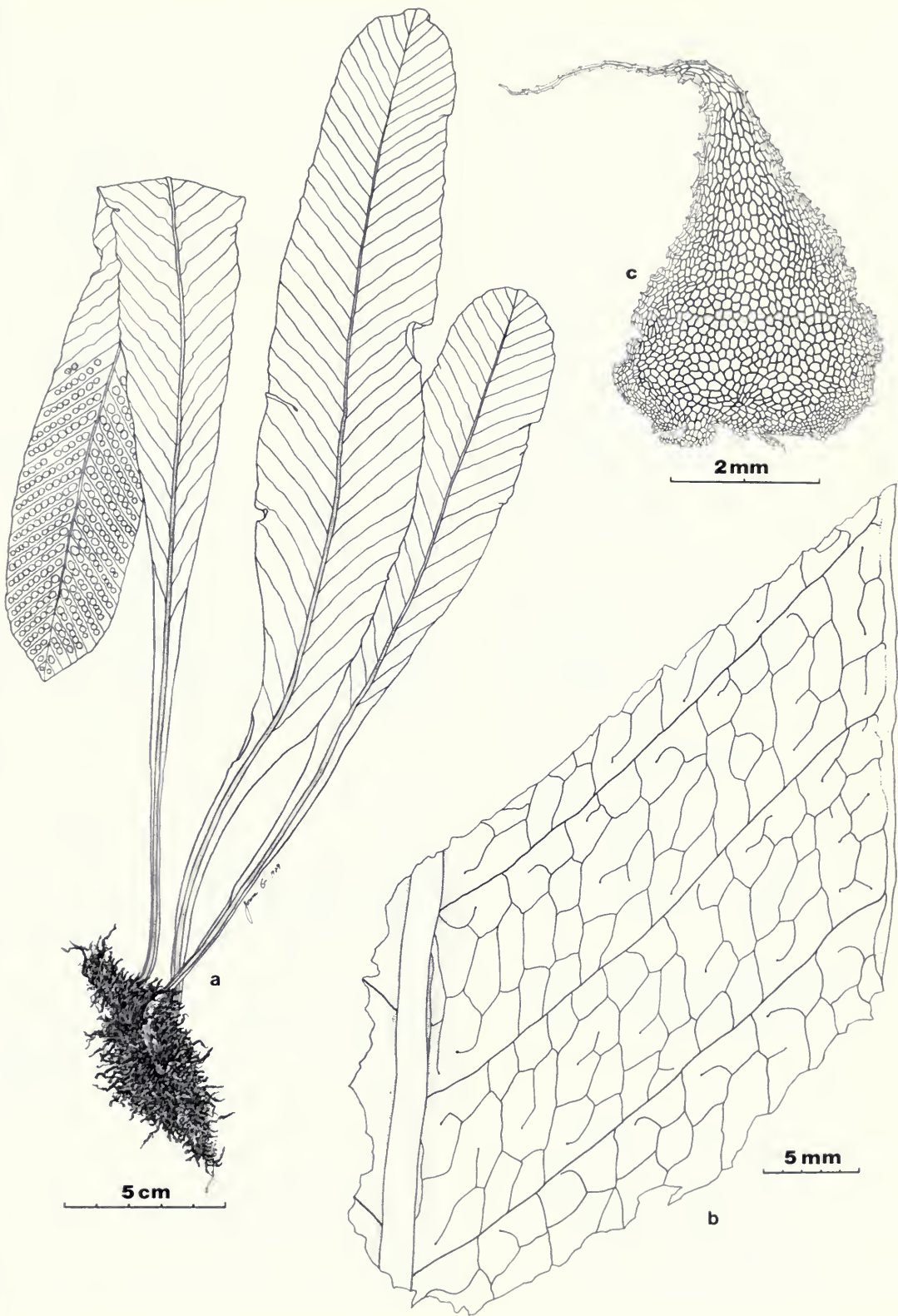
Polypodium albopunctatissimum Linden, Cat. 1860, nom. nud.

Pleuridium albopunctatissimum John Sm., Ferns Brit. for., ed. 1: 95. 1866, nom. nud.

Plants terrestrial, occasionally epipetric, very rarely epiphytic. **Stem** creeping, 8-10 mm in diameter, often pruinose, provided with broadly lanceolate, acuminate scales, these 7-10 mm long, plane throughout, conspicuously clathrate, usually strongly bicolorous, the central portion dark brown, the margins pale brown, entire or repand, lumina of the central portion essentially isodiametric or, toward the apex, slightly longer than broad. **Leaves** crowded, to 1.5 cm apart, on phyllopodia 2-10 mm long. **Petiole** 4-30 cm long. **Lamina** lanceolate, attenuate or acuminate at base, acuminate or acute at apex (20-)35-80 cm long, (3-)5-12 cm broad, provided adaxially with (usually) white-encrusted hydathodes. **Midrib** scales deciduous or lacking, rarely seen. **Primary veins** abaxially raised, often lighter in color than the laminar tissue. **Sori** in (5-)6-12 rows on each side of the midrib (at widest part of lamina). **Sporangia** with a few to 10 stout, (2-)3-celled trichomes on the capsule.

In or at the edges of forests or thickets, on the

FIG. 12. *Niphidium crassifolium*: a, habit; b, section of sterile lamina. *Niphidium macbridei*: c, stem scale. (Adapted in part from Stolze, Ferns and Fern Allies of Guatemala, 1981.)



forest floor or on road cuts or riverbanks, occasionally in rock crevices, very rarely on tree trunks, (300–)1600–3500 m, Piura to San Martín, southward to Huancavelica and Puno.

Southern Colombia to Bolivia.

This is scarcely distinct from *N. crassifolium* and perhaps might better be considered an elevational or geographic variant. The principal differences cited by Lellinger are the relative shape of lumina in the central, darker, portion of stem scales, and the relative width of the lighter colored distal margins. These are very subtle and often somewhat variable features that are usually supported by habit and elevation: *N. crassifolium* 95% of the time is an epiphyte, usually growing at lower elevation, and *N. albopunctatissimum* is usually terrestrial at higher elevation. Additionally, the latter often has pruinose stems and white encrustations on the hydathodes, whereas *N. crassifolium* seldom has pruinose stems and white hydathodes. Unfortunately, none of these supporting features are constant, so the two taxa must frequently be identified by using a majority of the suite of characters.

Piura: Prov. Huancabamba, Dist. Sónor, Cerro La Viuda, *Sagástegui et al.* 8201 (GH, HUT, MO, US). **Cajamarca:** Prov. Celendín, road to Gelig, *Mostacero et al.* 852 (F, HUT, MO). **Amazonas:** Prov. Chachapoyas, slopes of Puma-urcu SE of Chachapoyas, *Wurdack* 553 (F, US, USM). **La Libertad:** Prov. & Dist. Otuzco, near Chaulacocha, *Saunders* 897 (F, GH). **San Martín:** Prov. Mariscal Cáceres, Río Abiseo National Park, *Young* 1381 (HUT, USM). **Huánuco:** Muña, *Bryan* 676 (F, US). **Pasco:** Prov. Oxapampa, road to María Teresa and Llaupi, *Foster* 7611 (F, MO). **Junín:** Prov. Tarma, E of Huasahuasi, *Hutchison* 1124 (F, MO, US). **Huancavelica:** Prov. Tayacaja, Chuspi-Tocas, between Colcabamba and Paucarabamba, *Tovar* 2123 (GH, USM). **Cuzco:** Prov. La Convención, below San Martín on Río Apurímac, *Davis et al.* 1327 (F, GH). **Puno:** Prov. Sandia, between Sandia and Cuyocuyo, *Ferreira* 16804 (GH, USM).

3. *Niphidium carinatum* Lell., Amer. Fern J. 62: 113. 1972. TYPE: Peru, Huánuco, Hacienda Mercedes, Cayumba, *Mexia* 8223 (holotype, UC; isotypes, BM!, F!, GH!, MICH, MO; photos, F, MO & US of UC).

Plants epiphytic or terrestrial, rarely epipetric. **Stem** short-creeping, 6–10 mm in diameter, not pruinose, provided with lanceolate, acute to attenuate scales, these 8–10 mm long, longitudinally somewhat involute toward apex, not or scarcely clathrate (lumina small and occluded), bicolorous, the central portion dark brown to castaneous, the margins pale brown, entire or repand. **Leaves** crowded, to 1 cm apart, on phyllopodia 5–6 mm

long. **Petiole** commonly obsolete, rarely to 8 cm long. **Lamina** linear-lanceolate, attenuate at base, acute to rounded at apex, 30–65 cm long, 2–4.5 (–5) cm broad, provided adaxially with inconspicuous, light brown hydathodes, or these sometimes with a white incrustation. **Midrib** scales lacking. **Primary veins** abaxially raised, often lighter in color than the laminar tissue. **Sori** in 4–7 rows on each side of the midrib (at widest part of lamina). **Sporangia** with a few, to 12, stout, linear, unicellular trichomes on the capsule.

In forests or open places, commonly on trees, occasionally on road banks or in grassland, very rarely among rocks, 700–2200 m, along the Cordillera Central from Amazonas to Cuzco.

Colombia; Peru; Bolivia.

This species has rather narrow leaves crowded along a thick, short-creeping rhizome, but the scale characters that finally separate it from its nearest relatives are very subtle ones and often difficult to perceive. As Lellinger (1972, p. 113) observed in his revision of the genus, “it is the only species of the genus with involute—not plane—rhizome scales; the cells of the central band are only weakly clathrate and have occluded lumina.” However, the scales are involute only toward the apex, and then not strongly so. Therefore, careful study under high magnification is necessary to assess this character.

Amazonas: Prov. Bongará, trail to Shillac north of Pedro Ruiz, *D. Smith & Vásquez* 4951 (F, MO, UC). **San Martín:** Prov. Lamas, Alonso de Alvarado, Fundo las “Flores,” *Schunke* V. 6239 (F). **Huánuco:** Confluence of Monzón and Huallaga Rivers, near Tingo María, *Stork & Horton* 9502 (F, UC, US). **Pasco:** Prov. Oxapampa, Gran Pajonal, vicinity of Chequitavo, *D. Smith* 5274 (F, MO, UC). **Junín:** Huacapistana, *Coronado* 239 (GH, UC). **Ayacucho:** Prov. La Mar, 25 km from Tambo San Miguel, *Dudley* 11881 (GH). **Cuzco:** Aina (Ayna), between Huanta and Río Apurímac, *Killip & Smith* 22775 (US).

4. *Niphidium macbridei* Lell., Amer. Fern J. 62: 117. 1972. TYPE: Peru, Junín, Yanahuanca, *Macbride & Featherstone* 1234 (holotype, US!; isotypes, F!, GH!; photo, GH & UC of US). **Figure 12c.**

Plants epipetric. **Stem** creeping, 6–10 mm in diameter, pruinose, provided with lanceolate, long-attenuate scales, these 6–8(–10) mm long, obviously clathrate (the lumina large, clear, and conspicuous), bicolorous, the central portion blackish, the margins pale brown, irregularly ciliolate-dentate (at least distally), the apex filiform and often

contorted, the cells at this point uniseriate. **Leaves** commonly 0.5–2 mm apart, on phyllopodia 2–5 mm long. **Petiole** (3–)6–18 cm long. **Lamina** narrow-lanceolate, attenuate at base, rounded or acute at apex, 35–60 cm long, (2.5–)3.5–6.5 cm broad, provided adaxially with inconspicuous, whitish hydathodes. **Midrib** scales deciduous or lacking, rarely persistent. **Primary veins** abaxially raised, often lighter in color than the lamina tissue. **Sori** in 4–7(–9) rows on each side of the midrib (at widest part of lamina). **Sporangia** lacking trichomes.

In forests or open places, among rocks or in crevices of rock cliffs, 2500–3600 m, La Libertad, Huánuco, Junín, Apurímac, and Cuzco.

Endemic.

Besides the naked sporangia capsules, *N. macbridei* can also be distinguished by the apices of stem scales. The long and filiform tips are often strongly contorted and consist of a single series of cells. Scales of similar species may be very narrowly acute to somewhat attenuate, but never with a filiform, uniseriate tip.

La Libertad: Between Huamachuco and Cajabamba, *Correll & Smith P917* (GH). **Huanuco:** Prov. Pachitea, Panao, *Asplund 13619* (US). **Junín:** Main road below Palca, *Correll & Smith P760* (GH). **Apurímac:** Trail between Huancarama and Abancay, *West 3765*, (UC), 7765 (UC). **Cuzco:** Ollantaytambo, *Cook & Gilbert 544* (US). Prov. Urubamba, Chincheros, *Davis et al. 1751* (F), 1771 (F). Urubamba, *Soukup 158* (F, GH).

5. *Niphidium vittaria* (Mett.) Lell., Amer. Fern J. 62: 119. 1972.

Polypodium vittaria Mett., Fil. Lechl. 1: 8. 1856. TYPE: Peru, Puno, Tabina, *Lechler 2039* (holotype, B!, Herb. Mett.; isotypes, L, W, photos, F of B, US of B & L).

Plants epipetric, rarely epiphytic. **Stem** long-creeping, 3–5.5 mm in diameter, amply provided with lanceolate, long-attenuate scales, these 4–6 mm long, attached near the broadened base, their filiform tips rather conspicuously spreading, bicolorous, the central portion castaneous to blackish, the margins orange or pale brown, erose or often irregularly ciliate. **Leaves** commonly 1.5–3 cm apart, on phyllopodia 3–5 mm long. **Petiole** 3–10 cm long. **Lamina** linear-lanceolate, attenuate at both ends, rarely rounded at apex, 30–50 cm long, 0.8–2.2(–3) cm broad, provided adaxially with blackish or white-encrusted hydathodes. **Midrib** sparsely provided abaxially with (usually) persis-

tent scales like those of the stem, the base rounded, or occasionally succordate with auricles approximate or overlapping. **Primary veins** abaxially not or slightly raised, most of them darker in color than the lamina. **Sori** in 2–4 rows on each side of the midrib (at widest part of lamina). **Sporangia** rarely with several 1- or 2-celled trichomes on the capsule.

In forests, on and among rocks, or on rocky cliffs, rarely on trees, 1200–3200 m, La Libertad, Huánuco, Junín, Cuzco, and Puno.

Endemic.

This and *N. anocarpos* are usually easily distinguished from other species in Peru by the slender, long-creeping stems and the very narrow, well-spaced leaves. Both also have subpersistent scales scattered along the midrib abaxially, whereas midrib scales in other species of *Niphidium* are lacking or caducous. See *N. anocarpos* for further discussion.

La Libertad: Prov. Santiago de Chuco, Motil-Shorey, *Sagástegui et al. 11699* (MO) (F specimen is *Campylo-neurum*). **Huánuco:** Prov. Pachitea, Chaglla, *Huapalla 2028* (USM). Muña, *Macbride 3964* (US). **Junín:** Yaupe, *Woytkowski 6496* (MO, US). **Cuzco:** Prov. Cuzco, banks of Río Urubamba, *Angulo 1755* (GH, HUT). **Puno:** Ollachea to San Gabon (Gabán), *Dillon et al. 1151* (F, MO). Prov. Carabaya, Ollachea to Quillabamba, *Vargas 6905* (UC, US), 17514 (GH).

6. *Niphidium anocarpos* (Kunze) Lell., Amer. Fern J. 62: 120. 1972.

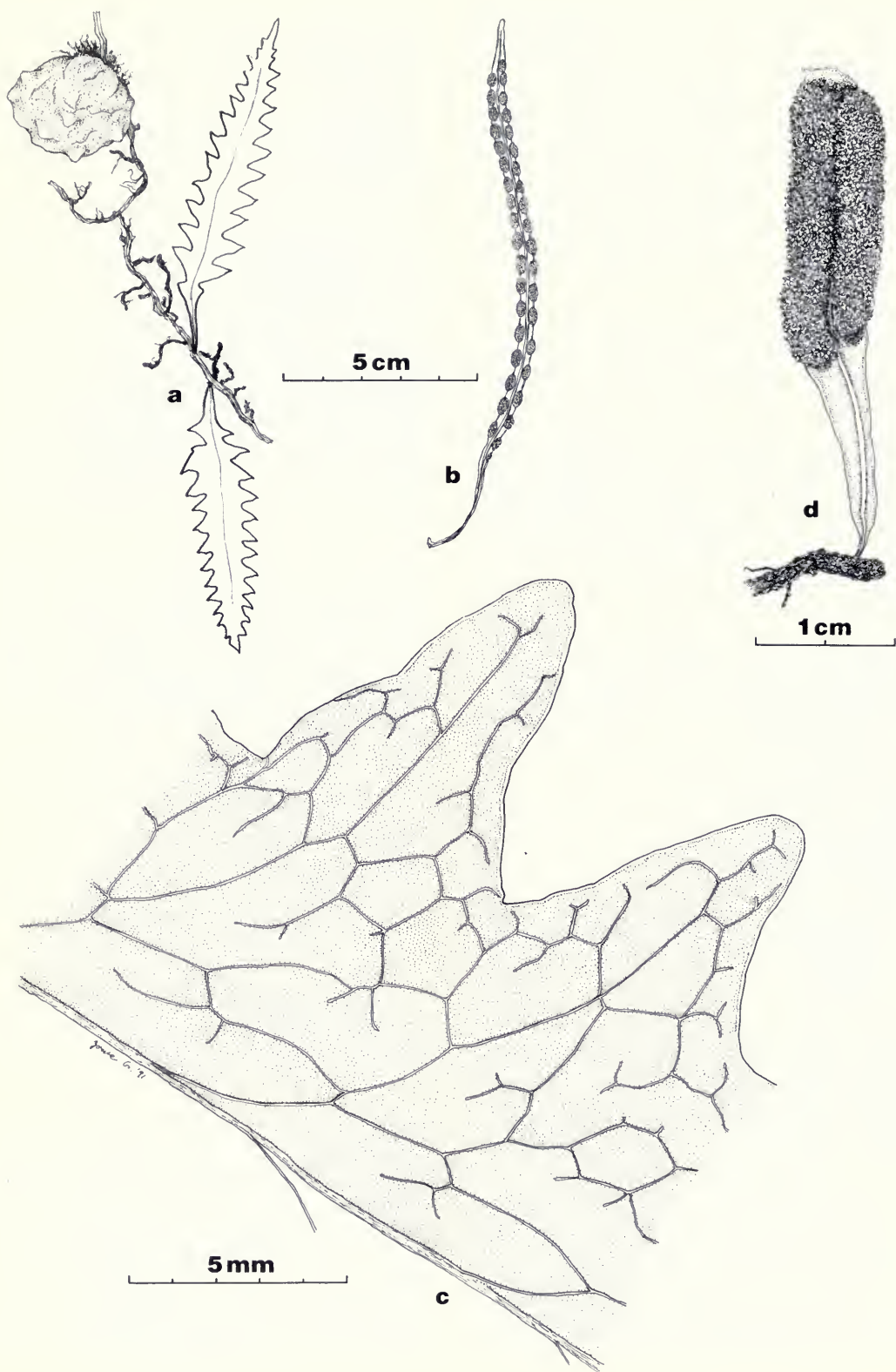
Polypodium anocarpos Kunze, Linnaea 9: 40. 1834.

TYPE: Peru, Huánuco, near Pampayaco (Pampayacu), *Poeppig 1128* (holotype, LZ, destroyed; isotype, designated as lectotype by Lellinger, B, Herb. Mett.; fragment, US!; photo, US of B).

Polypodium acrosorum Kunze, Linnaea 9: 39. 1834.

TYPE: Peru, Huánuco, near Pampayaco (Pampayacu), *Poeppig 1112* (holotype, LZ, destroyed; isotype, designated as lectotype by Lellinger, HBG; frag., US!; isoelectotypes, BR, HBG, L, LE, MO!; photos, F, GH, MO, UC & US of HBG).

Plants epiphytic or terrestrial, occasionally epipetric. **Stem** long-creeping, 3–5.5(–6) mm in diameter, copiously provided with ovate to ovate-lanceolate, acute to acuminate scales, these 2–3 mm long, tightly appressed, attached well above the base, bicolorous, the central portion black, the margins castaneous to pale brown, erose to short-fimbriate (the fringe often abraded in age). **Leaves** commonly 1–3 cm apart, on phyllopodia 2–4 mm long. **Petiole** 1–14 cm long. **Lamina** linear- to nar-



rowly elliptic-lanceolate, attenuate at both ends, 40–70 cm long, 1–3 cm broad, provided adaxially with brown hydathodes. **Midrib** sparsely provided abaxially with (usually) persistent scales similar to those of the stem, the base rounded, or occasionally cordate with an open sinus between the auricles. **Primary veins** abaxially not or slightly raised, most of them darker in color than the lamina. **Sori** in 3–4 rows on each side of the midrib (at widest part of lamina). **Sporangia** with several unicellular trichomes persistent on the capsule.

In forests, on trees and logs, sometimes on the forest floor, rarely on rocks, 1200–3950 m, Cajamarca, San Martín, Huánuco, Pasco, Cuzco, and Puno.

Peru; Bolivia.

This and *N. vittaria* are very similar and are maintained here, with some reluctance, as distinct. They are distinguished, at least in Peru, principally by subtle differences in their stem scales and habitat. Those of the latter species are commonly longer and narrower, with filiform tips spreading conspicuously from the stem. Their point of attachment is somewhat above the base but appears to be relatively nearer the base because of the long-attenuate scale apices. Stem scales of *N. anocarpos* are shorter and broader, with subacute or short-acuminate tips and are attached relatively near the scale center. Scale margins of both species are eorse, but sometimes irregularly ciliate along the attenuate tips in *N. vittaria*, or sometimes short-fimbriate in *N. anocarpos*. Tryon & Tryon 5392 (F, GH, US), from Prov. La Convención, Cuzco, is intermediate; scales are short (3 mm) and the base fimbriate, but the somewhat attenuate tips are irregularly ciliate.

Cajamarca: La Palma, 10 k NW of Chirinos, Gentry *et al.* 61190 (MO, UC). **San Martín:** Prov. Rioja, Venceremos, D. Smith 4514 (MO, UC, USM), 4636 (MO, UC, USM). **Huánuco:** Tambo de Vaca, Bryan 675 (F, US). Muña, Macbride 3975 (F, GH, US), 4041 (F, US). **Pasco:** Prov. Oxapampa, vicinity of Huanacabamba, D. Smith *et al.* 1679 (F, MO). **Cuzco:** Prov. La Convención, Dist. Vilcabamba, trail from Yupanquí to Apurímac, Davis *et al.* 1231 (GH). Urubamba, Machu Picchu, Peyton & Peyton 595 (GH), 1458 (GH, MO). **Puno:** Prov. Carabaya, below Ollachea, Vargas 6905 (US).

IX. *Solanopteris*

Solanopteris Copel. Amer. Fern J. 41: 75, 128, 1951. TYPE: *Solanopteris bifrons* (Hooker) Copel. (*Polypodium bifrons* Hooker). **Figure 13.**

Microgramma subg. *Solanopteris* (Copel.) Lell., Amer. Fern J. 67: 59. 1977.

Plants epiphytic. **Stem** usually pruinose, long-creeping, commonly with highly modified, swollen, hollow (in age) tubers borne on short, lateral branches, with mostly circular scales and usually few roots. **Leaves** strongly to weakly dimorphic (the fertile commonly longer and narrower than the sterile), 3–18 cm long, well spaced on the stem, occasionally borne on a tuber, articulate to short phyllopodia on the stem. **Lamina** entire to pinnately lobed, naked or sparsely scaly, attenuate to base, the petiole essentially obsolete. **Veins** anastomosing, with included, free veinlets spreading in all directions. **Sori** discrete and round to oval, or merged into continuous or interrupted lines, on a raised receptacle, served by few to many veins, exindusiate, sporangia intermixed with abundant paraphyses. **Spores** monoletate, ellipsoid, echinate with a dense glandular deposit on the spines.

Solanopteris contains three or four species, all in South America, with one, *S. brunei* (Christ) Wagner, also occurring in Costa Rica. This and *Lecanopteris* are unique in the family in the swollen tubers which commonly are inhabited by ants, and the long-spiny perispore of the spores (Henipman, 1990, p. 423; Tryon & Tryon, 1972, p. 737). It further differs from *Microgramma*, with which it was included by Lellinger (1977), by the small, mostly circular, stem scales. The plants are mostly high epiphytes, often growing in upper branches of trees, so they are easily overlooked; thus species may be far more widespread than currently supposed. Two species thus far have been found in Peru, but the other two (which may be synonymous) eventually may be collected here as well. See treatment of *S. bismarckii* for further discussion.

FIG. 13. *Solanopteris bifrons*: a, habit, with sterile leaves and tuber; b, fertile leaf; c, section of sterile lamina. *Solanopteris bismarckii*: d, habit, with fertile leaf. (a, b, c from Klug 2643, GH; d from Rauh 35685, USM.)

The genus was initially published as *Solenopteris*. However Copeland immediately corrected it to *Solanopteris* in the index and in errata in the same publication.

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———. 1973. *Solanopteris bismarckii* Rauh, Abh. Akad. Wiss. Abh. Lit. Mainz, Math.-Naturwiss. Kl., **3**: 223–256; and Tropische und subtropische Pflanzenwelt, **5**: 5–38.

TRYON, R. M., AND A. F. TRYON. 1982. *Solanopteris*, pp. 735–738. In Ferns and Allied Plants. Springer-Verlag, New York.

Key to Species of *Solanopteris*

- a. Sterile leaf entire to (rarely) slightly repand, chartaceous to subcoriaceous; stem scales copious, often obscuring the surface of the stem; sori merged into a continuous or interrupted line, the discrete portions (if any) more than twice as long as broad 1. *S. bismarckii*
- a. Sterile leaf pinnately lobed, thin-herbaceous; stem scales sparsely scattered; sori usually discrete, round or oval 2. *S. bifrons*

1. *Solanopteris bismarckii* Rauh, Akad. Wiss. Abh. Math.-Naturwiss. Kl. **5**: 232. 1973. TYPE: Peru, Pasco, Chanchamayo Valley near Oxapampa, Ceja de Montaña, *Rauh 25790* (holotype, HEID). **Figure 13d.**

Plants epiphytic. **Stems** to 3 mm thick, bearing globular, swollen, often ant-inhabited tubers to 2.5 cm in diameter, stem scales abundant, often so crowded as to obscure the stem surface, most of them round, 0.2–0.5 mm in diameter, but occasionally short- and broad-ovate, conspicuously bicolorous, castaneous at point of attachment and with narrow or broad, white or ash-gray margins. **Leaves** weakly dimorphic, sterile ones 3–5 cm long, 0.6–1.4 cm broad, fertile ones relatively longer and narrower. **Lamina** lanceolate to oblanceolate, chartaceous to subcoriaceous, the margins entire or weakly repand, sparsely dotted with small, ovate, castaneous scales, these especially along the costa abaxially. **Veins** indistinct, secondary and tertiary veinlets about the same thickness and prominence as the primary ones which enclose them. **Sporangia** merged into a continuous, long, line which, at maturity, covers the lamina between costa and margin.

In forests, creeping along the branches of trees, 1100–2000 m, San Martín, Pasco, and Cuzco.

Apparently endemic.

This might be confused with *S. tuberosa* (Maxon) Rauh, of Ecuador, which has similar (although slightly larger) leaves and continuous to somewhat interrupted sori. But the latter differs significantly in type of venation and stem scales. In *S. tuberosa* primary veins are thicker and more prominent than the subsidiary veinlets they enclose. Stem scales, though often round, are predominantly lanceolate-attenuate and castaneous, with very narrow and tawny margins. In *S. bismarckii* (as well as in *S. bifrons*) all veins are of the same thickness, and stem scales are predominantly circular and with mostly broad, whitish margins.

Solanopteris tuberosa scarcely differs from *S. brunei* (Christ) Wagner (Costa Rica, Panama, Colombia). Both have similar leaf shape, venation, and stem scales, and have been separated essentially by the discrete, round sori of the latter. However, there is enough variability in this character to render it of questionable value. Distribution of the *S. brunei/tuberosa* complex may extend from Costa Rica to Ecuador, and perhaps even into Peru (pending more careful exploration in the canopies of tropical forests).

San Martín: Prov. San Martín, Rioja-Pomacochas Road, below Venceremos, *Gentry & Smith 45184* (MO). **Pasco:** Prov. Oxapampa, 10 km from Oxapampa, *Rauh*

35685 (USM). **Cuzco**: "Cuyulichayoc" Hacienda, Ccochayoc, *Bües* 1732 (US).

2. ***Solanopteris bifrons*** (Hooker) Copel., Amer. Fern J. 41: 75, 128. 1951. **Figures 13a-c.**

Polypodium bifrons Hooker, Fil. exot., t. 52. 1859.

TYPE: Ecuador, riverside near Archidóna, *Jame-son* 789 (holotype, K; frag., US!).

Microgramma bifrons (Hooker) Lell., Amer. Fern J. 67: 59. 1977.

Plants epiphytic. **Stems** 1–2 mm thick, bearing spherical, swollen, ant-infested tubers to 2.5 cm in diameter, stem scales sparsely scattered, circular, 0.2–0.4 mm in diameter, somewhat bicolorous, castaneous, with a rather narrow, orange (rarely whitish) margin. **Leaves** strongly dimorphic; sterile ones 4–10 cm long, 1–3 cm broad; lamina elliptic, thin-herbaceous, pinnately lobed $\frac{1}{3}$ – $\frac{2}{3}$ to the costa, scales rare or lacking; veins distinct, secondary and tertiary veinlets the same thickness and prominence as the primary ones which enclose them. **Fertile leaves** like the sterile ones, but 6–18 cm long and 0.3–1 cm broad, margins sinuate to weakly lobed. **Sporangia** grouped into large (4–5 mm), discrete, round or oval sori, in a single series between costa and margin.

In wet forests, on shrubs, small trees, or on branches in the canopy, 180–900 m, Amazonas south to Cuzco and Madre de Dios.

Colombia; Ecuador; Peru.

In addition to the differences noted in the key, the stem scales of *S. bismarckii* are strongly bicolorous, the margins mostly broad and whitish; whereas scale margins of *S. bifrons* are narrow and orange-brown. Furthermore, *S. bifrons* occurs at lower elevations than *S. bismarckii*, the former under and the latter over 1000 m.

Amazonas: Río Santiago, 700 m past Caterpiza, *Huashikat* 754 (MO). **San Martín**: Pongo de Cainarachi, Río Cainarachi, *Klug* 2643 (F, GH, US). Km 28, road to Yurimaguas, *Maguire* 61522 (UC). Tarapoto, El Pongo, *Rauh* (USM). **Pasco**: Prov. Oxapampa, Palcazú, Río Alto Iscozacín, Ozuz, *Foster & d'Achille* 9957 (F). Drainage of Río Palcazú on road NW of Villa Rica, *Gentry & Smith* 36054 (F, MO). **Ucayali** (as Loreto): Prov. Coronel Portillo, lower Boquerón of Padre Abad, *Hutchison et al.* 6039 (F, UC, US). **Cuzco**: Prov. Paucartambo, Cosñipata Valley, Río Tono Road, *Foster et al.* 10578 (F). Prov. Quispicanchi, Inambari, *Vargas* 13497 (GH). **Madre de Dios**: Manú, Río Salvación, *Núñez et al.* 8067 (F, MO).

X. *Platynerium*

Platynerium Desv., Mém. Linn. Soc. Paris 6: 213. 1827. TYPE: *Platynerium alcorni* Desv., nom. nov. for *Acrostichum alcorni* Sw. 1801, not Willemet, 1796. **Figure 14.**

Plants epiphytic. **Stem** ascending, stout, provided with scales and many fibrous roots. **Leaves** solitary or fasciculate, dimorphic (or in one African species monomorphic), the sterile, "nest" leaves 25–100 cm long, appressed at least basally, with petiole continuous, the fertile ones to 3 m long, erect-spreading to (more commonly) pendent, with petiole articulate. **Lamina** entire or lobed to dichotomously forked, closely and finely pubescent, with stellate trichomes. **Veins** anastomosing, with or without included, free veinlets. **Sporangia** borne in soral patches in certain discrete, extensive areas of the fertile lamina, along the nearly unmodified veins, with or without paraphyses. **Indusia** lacking. **Spores** monolet, ellipsoid, the surface nearly smooth, but with a dense, spherical deposition.

The genus consists of 14 species in Asia and Africa and only one in America. The species, all epiphytic, occur in lower to middle elevations in tropical or subtropical forests. They grow on the trunks or lowest forks of trees or in the higher branches. The broad, overlapping "nest" leaves are modified for collection of humus. Sporangia, in all but two species, are borne along the veins, but at maturity they are so abundant and crowded they appear acrostichoid.

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1. ***Platynerium andinum*** Baker, Ann. Bot. (London) 5: 496. 1891. LECTOTYPE (designated by Hennipman and Roos, 1982): Peru, San Martín (as Loreto), Tarapoto, *Spruce* 4739 (K; isolectotype, P). **Figures 14a-c.**

Plants epiphytic. **Stem** abundantly provided with linear or linear-lanceolate, attenuate, basally at-

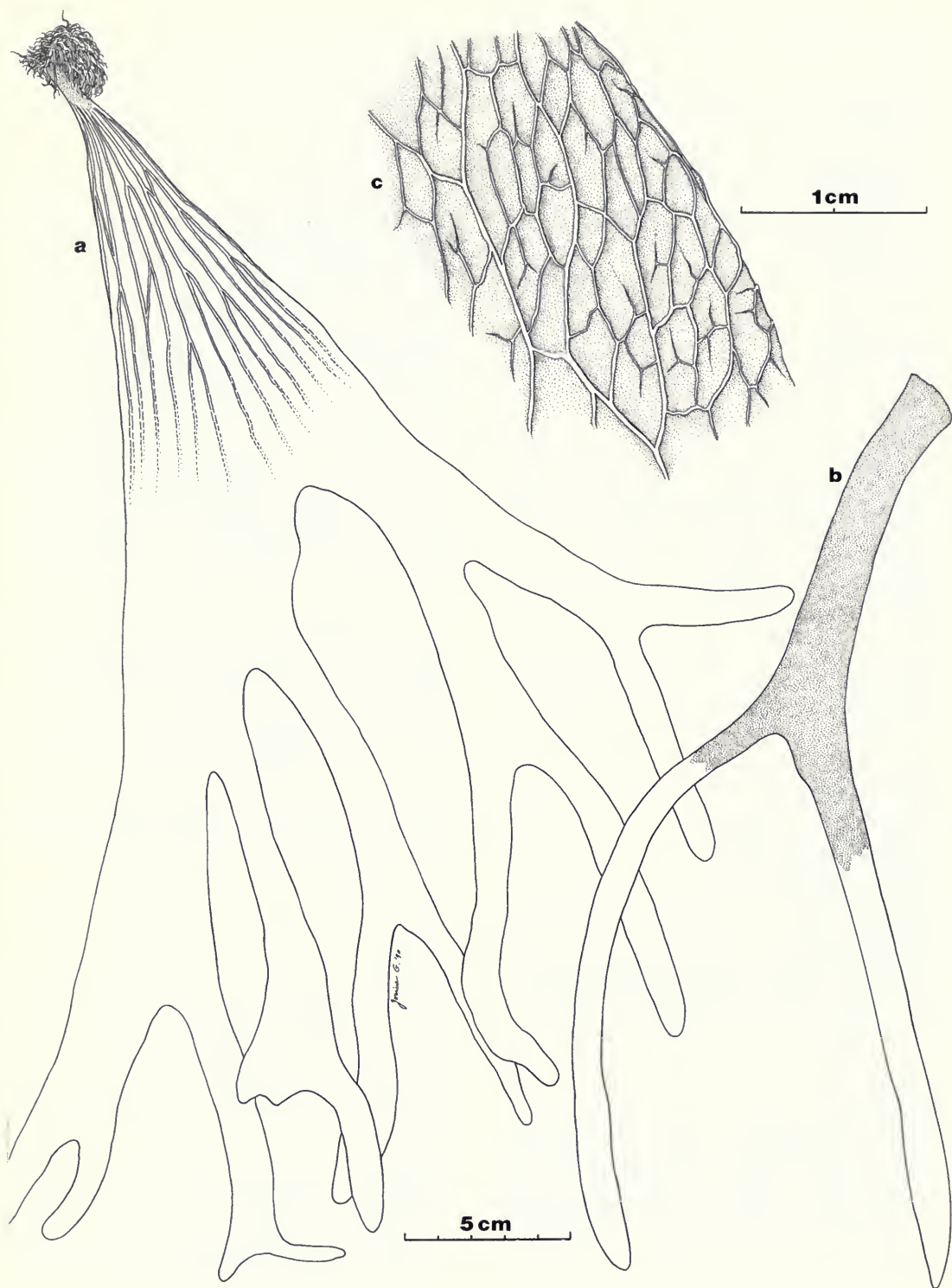


FIG. 14. *Platycerium andinum*: a, habit, sterile leaf; b, distal portion of fertile leaf; c, venation of sterile leaf near margin. (a from *Ll. Williams* 5734, F; b, c from *Klug* 3872, F.)

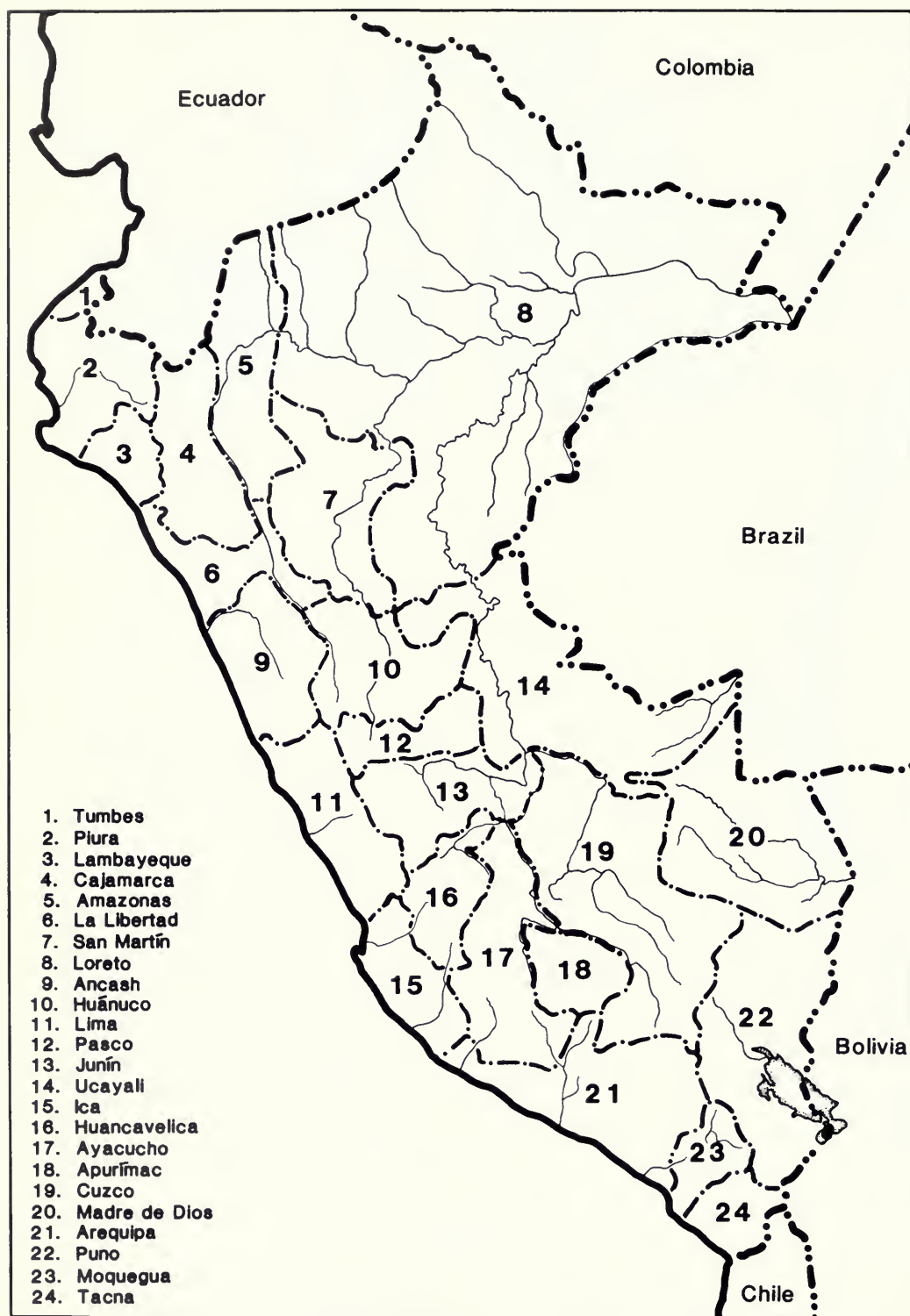
tached scales, these 0.5–1.5 cm long, light or reddish brown. **Leaves** fasciculate, densely pubescent with stellate trichomes, these often obscuring the fertile lamina abaxially. **Nest leaves** sessile, wedge-shaped, entire, or lobed apically, soon turning brown: **veins** copiously reticulate, primary and secondary ones prominulous and conspicuous, with frequent, usually obscure, free, included veinlets. **Fertile leaves** short-stalked, 1–3 m long, 3–5 times subdichotomously forked; primary **veins** prominent, the rest obscure; **soral patches** usually extending from near the first fork of the lamina to beyond the ultimate fork.

On tree trunks in wet forests, 210–800 m, San Martín and Junín.

Peru; Bolivia.

The dichotomously branching, pendent, fertile leaves and the sterile, clasping, nest leaves are so distinctive that this cannot be confused with any species of fern in Peru. It apparently is confined to the low, wet forests of Peru and Bolivia, although Hennipman and Roos (1982) saw a specimen with a label that was illegible except for the word “Ecuador.”

San Martín: Juan Jui, Alto Río Huallaga, *Klug 3872* (F, GH, MO, US). Along Río Huallaga, NE of Shapaja on road to Cazuta, *Knapp & Mallet 6921* (F, MO). Prov. Mariscal Cáceres, Dist. Pajarillo, *Schunke V. 13493* (USM). Alto Río Huallaga, *Ll. Williams 5734* (F, US), *6638* (F). **Junín:** Prov. Satipo, 1 km from Puerto Ocopa, road from Mazamari to Puerto Ocopa, *Fernández & Callegari 683* (USM).



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